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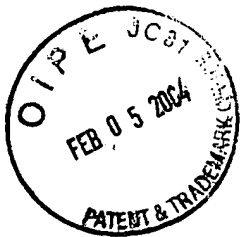
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S&H Form: (2/01)

Attorney Docket No. 1330.1085

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Frank Joseph KALAS, Jr.

Application No.: 10/075,594

Confirmation No.: 9408

Filed: February 15, 2002

For: AUTOMATED DATA CAPTURE SYSTEM

Group Art Unit:

Examiner: Unassigned

RECEIVED

FEB 11 2004

OFFICE OF PETITIONS

**PETITION TO REVIVE ABANDONED APPLICATION**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Sir:

A Notice of Abandonment was mailed January 14, 2004, and indicates that the above-referenced application was abandoned for failure to respond to the Notice to File Missing Parts mailed April 4, 2002.

However, a response to the Notice to File Missing Parts was filed on May 15, 2002. A copy of the response and the USPTO mailroom date-stamped filing receipt are enclosed herewith.

**Therefore, it is respectfully requested that the holding of abandonment be withdrawn, and that the application proceed to examination.**

It is respectfully submitted that no petition fee is required for this petition. However, if any fees are due, please charge such fees to our Deposit Account No. 19-3935.

\* \* \*

Moreover, an IDS was filed on June 14, 2002. However, the USPTO PAIR System does not show the IDS as having been filed. Therefore, a copy of the IDS and the USPTO

2/23/2004 AKELLEY 00000002 193935 10075594

CF FC:1951 130.00 DA

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Serial No.: 10/075,594

Docket No.: 1330.1085

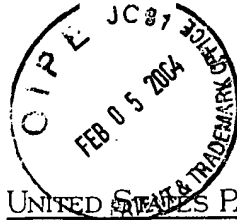
mailroom date-stamped filing receipt are enclosed herewith. It is respectfully requested that the IDS be considered.

Respectfully submitted,

STAAS & HALSEY LLP

Date: February 5, 2004 By: Paul I. Kravetz  
Paul I. Kravetz  
Registration No. 35,230

1201 New York Ave, N.W., Suite 700  
Washington, D.C. 20005  
Telephone: (202) 434-1500  
Facsimile: (202) 434-1501



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/075,594	02/15/2002	Frank Joseph Kalas JR.	1330.1085

21171  
 STAAS & HALSEY LLP  
 SUITE 700  
 1201 NEW YORK AVENUE, N.W.  
 WASHINGTON, DC 20005

**RECEIVED****FEB 11 2004****OFFICE OF PETITIONS****CONFIRMATION NO. 9408****ABANDONMENT/TERMINATION  
LETTER**

\*OC000000011687350\*

Date Mailed: 01/14/2004

**NOTICE OF ABANDONMENT UNDER 37 CFR 1.53 (f) OR (g)**

The above-identified application is abandoned for failure to timely or properly reply to the Notice to File Missing Parts (Notice) mailed on 04/04/2002.

- No reply was received.

A petition to the Commissioner under 37 CFR 1.137 may be filed requesting that the application be revived.

Under 37 CFR 1.137(a), a petition requesting the application be revived on the grounds of **UNAVOIDABLE DELAY** must be filed promptly after the applicant becomes aware of the abandonment and such petition must be accompanied by: (1) an adequate showing of the cause of unavoidable delay; (2) the required reply to the above-identified Notice; (3) the petition fee set forth in 37 CFR 1.17(l); and (4) a terminal disclaimer if required by 37 CFR 1.137(d).

Under 37 CFR 1.137(b), a petition requesting the application be revived on the grounds of **UNINTENTIONAL DELAY** must be filed promptly after applicant becomes aware of the abandonment and such petition must be accompanied by: (1) a statement that the entire delay was unintentional; (2) the required reply to the above-identified Notice; (3) the petition fee set forth in 37 CFR 1.17(m); and (4) a terminal disclaimer if required by 37 CFR 1.137(d).

Any questions concerning petitions to revive should be directed to the "Office of Petitions" at (703) 305-9282. Petitions should be mailed to: Mail Stop Petitions, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

*A copy of this notice **MUST** be returned with the reply.*

Z-Moguss

Customer Service Center

Initial Patent Examination Division (703) 308-1202

PART 2 - COPY TO BE RETURNED WITH RESPONSE

\* Missing Parts filed 5-15-02



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2-14-04

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/075,594	02/15/2002	Frank Joseph Kalas JR.	1330.1085

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OFFICE OF PETITIONS

CONFIRMATION NO. 9408

ABANDONMENT/TERMINATION  
LETTER

\*OC000000011687350\*

21171  
 STAAS & HALSEY LLP  
 SUITE 700  
 1201 NEW YORK AVENUE, N.W.  
 WASHINGTON, DC 20005

Date Mailed: 01/14/2004

**NOTICE OF ABANDONMENT UNDER 37 CFR 1.53 (f) OR (g)**

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Any questions concerning petitions to revive should be directed to the "Office of Petitions" at (703) 305-9282. Petitions should be mailed to: Mail Stop Petitions, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

*A copy of this notice **MUST** be returned with the reply.*

Z-Moguss

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Initial Patent Examination Division (703) 308-1202

PART 1 - ATTORNEY/APPLICANT COPY

JAN 16 2004

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Copy Notice To File Missing Parts of Nonprovisional Application; executed Declaration; fourteen (14) sheets of formal drawings (Figs. 1-14); Form PTO-1595 and executed Assignment; late filing surcharge  
assignment recordal fee

CHECK \$130 ✓

CHECK \$40.00 ✓

APPLICANT(S): Frank Joseph KALAS, Jr.

SERIAL NO: 10/075,594

CONFIRMATION NO. 9408

TITLE: AUTOMATED DATA CAPTURE SYSTEM

FILING DATE: February 15, 2002

DOCKET NO: 1330.1085 (PIK):bh

DUE DATE: June 4, 2002

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OFFICE OF PETITIONS



8

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IDS; Form PTO-1449 1 sheet, and sixteen (16) references

NO CHECK

APPLICANT(S): Frank Joseph KALAS, Jr.

SERIAL NO: 10/075,594

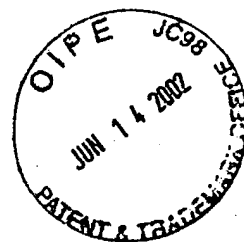
CONFIRMATION NO.9408

TITLE: AUTOMATED DATA CAPTURE SYSTEM

FILING DATE: February 15, 2002

DOCKET NO: 1330.1085/(PIK):bh

DUE DATE: none



16

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Frank Joseph KALAS, Jr.

Application No.: 10/075,594

Group Art Unit: Unassigned

Filed: February 15, 2002

Examiner: Unassigned

For: AUTOMATED DATA CAPTURE SYSTEM

**INFORMATION DISCLOSURE STATEMENT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

In accordance with the duty of disclosure provisions of 37 CFR § 1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the subject application.

1. Enclosures accompanying this Information Disclosure Statement are:

- 1a. ☒ Form PTO-1449.
- 1b. ☒ Copies of IDS citations.
- 1c. ☐ An English language copy of search report(s) from a counterpart foreign application or a PCT International Search Report.
- 1d. ☐ English language translation (complete or relevant portion(s)) attached to each non-English language publication.
- 1e. ☐ Explanations of Relevancy of References (ATTACHMENT 1(e), hereto) for providing a concise explanation of each non-English publication.
- 1f. ☐ List of Copending Applications (ATTACHMENT 1(f), hereto).
- 1g. ☐ List of Additional Submitted Documents (ATTACHMENT 1(g), hereto).

2. ☒ This Information Disclosure Statement is filed under 37 CFR §1.97(b):

*(Check either Item 2a or 2b or 2c or 2d)*

- 2a. ☐ Within three months of the filing date of a national application other than a Continued Prosecution Application under § 1.53(d);
- 2b. ☐ Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application.
- 2c. ☒ Before the mailing of a first Office Action on the merits; or
- 2d. ☐ Before the mailing of a first Office Action after the filing of a Request for Continued Examination under § 1.114.



3. ☐ This Information Disclosure Statement is filed under 37 CFR § 1.97(c) after the period specified in paragraph 2 above but before the mailing date of any of a Final Office Action under § 1.113, a Notice of Allowance under § 1.311 or an action that otherwise closes prosecution in the application, AND

*(Check either Item 3a or 3b; Item 3b to be checked if any reference known for more than 3 months)*

- 3a. ☐ The § 1.97(e) Statement in Item 5 below is applicable; OR  
3b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) is:  
☐ enclosed.  
☐ to be charged to Deposit Account No. 19-3935.

4. ☐ This Information Disclosure Statement is filed under 37 CFR §1.97(d) after the period specified in paragraph 3 above, but on or before payment of the Issue Fee, AND

- 4a. ☐ The § 1.97(e) Statement in Item 5 below is applicable; AND  
4b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) is:  
☐ enclosed.  
☐ to be charged to Deposit Account No. 19-3935.

5. ☐ Statement under § 1.97(e) (*applicable if Item 3a or Item 4 is checked*)  
*(Check either Item 5a or 5b)*

- 5a. ☐ In accordance with 37 CFR § 1.97(e)(1), it is stated that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.  
5b. ☐ In accordance with 37 CFR § 1.97(e)(2), it is stated that no item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this Information Disclosure Statement was known by any individual designated in §1.56(c) more than three months prior to the filing of this Information Disclosure Statement.

6. ☐ This is a continuation/divisional/continuation-in-part application under 37 CFR § 1.53(b).

*(Check appropriate Items 6a and/or 6b)*

- 6a. ☐ Copies of the publications listed on the attached Form PTO-1449 which were previously cited in prior application Serial No. \_\_, filed on \_\_, and which is relied on for an earlier effective filing date for the subject application under 35 U.S.C. § 120, have been omitted pursuant to 37 CFR § 1.98(d).  
6b. ☐ Copies of the publications listed on the attached Form PTO-1449 which were not previously cited in prior application Serial No. \_\_, filed on \_\_, and which is relied on for an earlier effective filing date for the subject application under 35 U.S.C. § 120, are provided herewith.

7. ☐ This is a continuation/divisional application under 37 CFR § 1.53(d) or Request for Continued Examination under 37 CFR 1.114.

*(Check either Item 7a or 7b)*

- 7a. ☐ The Issue Fee has not been paid.  
7b. ☐ A Petition to Withdraw from issue under 37 CFR §1.313(c) is filed concurrently herewith or has been granted. A continuation application under 37 CFR § 1.53(d) or Request for Continued Examination under 37 CFR 1.114, after payment of the Issue Fee is proper in accordance with 37 CFR § 1.53(d)(1)(ii) or 37 CFR 1.114(a), respectively.

8. ☐ This is a Supplemental Information Disclosure Statement.

*(Check either Item 8a or 8b)*

- 8a. ☐ This Supplemental Information Disclosure Statement under 37 CFR § 1.97(f) supplements the Information Disclosure Statement filed on \_\_\_\_\_. A bona fide attempt was made to comply with 37 CFR § 1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental IDS can be considered as if properly filed on \_\_\_\_\_.  
8b. ☐ This Supplemental Information Disclosure Statement is timely filed within one (1) month of the Notice under 37 CFR § 1.97 and 1.98, mailed \_\_\_\_\_. (MPEP 609 C(1), Form ¶ 6.49, Rev. 1, Feb. 2000, pp. 600-107)

9. ☐ In accordance with 37 CFR § 1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:

*(Check appropriate Items 9a, 9b, 9c and/or 9d)*

- 9a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office. (See U.S. Patent & Trademark Office's authorization in the Federal Register, Vol. 57, No. 12, January 17, 1992, at page 2031 (Reply to Comment 68).)  
9b. ☐ set forth in the application.  
9c. ☐ satisfied because an English language translation (complete or relevant portion(s)) is attached to each non-English language publication.  
9d. ☐ enclosed as Attachment 1(e), hereto.

10. No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than search report(s) from a counterpart foreign application or a PCT International Search Report, if submitted herewith). 37 CFR §§ 1.97(g) and (h).

11. The Commissioner is authorized to credit any overpayment or charge any additional fee required under 37 CFR § 1.17 for this Information Disclosure Statement and/or Petition to Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Dated: June 14, 2002  
700 Eleventh Street, N.W., Suite 500  
Washington, D.C. 20001  
Telephone: (202) 434-1500  
Facsimile: (202) 434-1501

By: Paul I. Kravetz  
Paul I. Kravetz  
Registration No. 35,230

FORM PTO-1449	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY DOCKET NO. 1330.1085	APPLICATION NO. 10/075,594
LIST OF REFERENCES CITED BY APPLICANT  (Use several sheets if necessary)		FIRST NAMED INVENTOR Frank Joseph KALAS, Jr.	
		FILING DATE February 15, 2002	GROUP ART UNIT Unassigned

## OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

AA	"Innovative Aircraft: Safety Testing," NDT Update, Sept. 1999, v8, i9, pNA.
AB	"Leaders in Facilities Maintenance Management," Giga Information Group IdeaByte, Giga Information Group, May 1, 2002, p. 5.
AC	Moad, Jeff, "Pratt & Whitney plans global upgrade; hires Vanstar as outsourcer," PC Week, v13, n19, pE1 (3), May 13, 1996.
AD	Ivara Corporation - Products/Solutions, July 14, 2000, pp. 1-6.
AE	"Ground Maintenance & Engineering," Gold Overview, Y2K Compliance Statement, Spirent Systems, July 5, 2000.
AF	MPXconnect, Datastream Systems, Inc., web page, July 10, 2000, pp. 1-2.
AG	"Boeing to Launch More Powerful Version of Portable Maintenance Aid," News Release, February 16, 1999, The Boeing Company.
AH	"Airline Demand for Boeing's Portable Maintenance Aid Grows 100 Percent -- New, More Powerful Version on the Way," News Release, February 16, 1999, The Boeing Company.
AI	Krizner, Ken, "For the DoD, ADC technology is SOP - Finding an engine for a Navy aircraft? Vehicle maintenance across the globe? A suite of ADC technologies will improve all facets of logistics," Advanstar Communications, Inc., Feb. 2000, v1, i2, p. 10.
AJ	Mecham, Michael, "Software Solutions Making MRO 'Smarter'," Aviation Week, August 30, 1999, The McGraw-Hill Companies, Inc.
AK	Broderick, Sean, "Delta Mechanics Embrace New Shop Floor Technology," Aero Safety & Maintenance, a Division of The McGraw-Hill Companies, January 14, 2000.
AL	Kelly, Sean, "Paperless aircraft inspection," Communication News, May 2000 v37 i5, p. 108
AM	"Software enhances shop floor planning," Aerospace Engineering, Publication of SAE International, November 1999, page 21
AN	Proulx, Jim, "IT Packages all Set for MRO Push," January/February 2000, CIMLINC Article: p. 51, Overhaul Maintenance, a Division of The McGraw-Hill Companies
AO	"The Total Solution," e-shopfloor, web page printout from July 18, 2000, <a href="http://www.cimlinc.com/solu-total.htm">http://www.cimlinc.com/solu-total.htm</a> .
AP	Thurlby, Robert, et al., "The application of systems dynamics to the re-engineering of value processes," Executive Development, v8n4, pp. 26-31, 1995.

EXAMINER	DATE CONSIDERED
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

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## NDT Update

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Sept 1999 v8 i9 pNA

Document 1 of 14 ➔

### Innovative Aircraft : Safety Testing.

#### Related Information

[Companies](#)[Products](#)[Topics](#)

#### Full Text

Researchers at Iowa State University's Institute for Physical Research and Technology (IPRT) are turning an art into a useful and cost-effective technology in the form of the "tapper." This new technology, developed by IPRT's Center for Nondestructive Evaluation and the Airworthiness Assurance Center of Excellence, will aid **aircraft** technicians in detecting flaws on particular **aircraft** structures.

Many **aircraft** structures have a fiberglass skin and honeycomb paper and resin core. Such parts, including the spoilers on **aircraft** wings that control stability, are vulnerable to bonding separation and may become damaged without leaving visible signs. The tapper could end the traditional art of tapping a coin on these parts to sense damage by listening for changes in pitch.

While the "tapping" technique is still an important aspect of the technology, the coin has been abandoned for an accelerometer with a brass tip. Connected to a notebook computer, the accelerometer measures the duration of the tapper's impact on an object. John Peters, a member of the research team explained, "If a heavy object like a bowling ball were dropped on a concrete floor, it would strike quickly and have a short duration impact. In contrast, a bowling ball dropped on a mattress resting on a concrete floor would remain on the mattress for a longer period and register a longer duration impact."

The tapper's impact is converted into numerical data and recorded in a Microsoft Excel computer file. The computer then displays the percent reduction in the stiffness of the part resulting from flaws or damage. Plastic transparencies with grids are used as guides to tap and thoroughly inspect a part.

The new tapper outshines the coin method and other instrumented tappers on many levels. It is inexpensive and portable, consisting of a few small parts including the accelerometer, notebook computer and software, and electronic circuits. Data from tapping the accelerometer is collected quickly and accurately into an Excel file. The technology requires little training to operate, and provides an historical record of previous tests by monitoring an area over time and recording past **inspecti n** information. Most importantly, the tapper ensures a reliable reading because noise from loud airplane **maintenance** hangers doesn't hinder its performance.

"The inspector can make a much better assessment of the size, shape and severity of a defect with an image that shows the percent reduction of the stiffness due to flaws and damage," said David Hsu of CNDE, leader of the tapper's research team.

An even better tapper may soon be on the way. According to ISU researchers, a mechanized tapper that inspects larger mapping areas is currently in development at the US Department of Energy's Ames Laboratory, and a working prototype may be ready for field testing in the next year.

Contact: David Hsu, Center for Nondestructive Evaluation, Tel: 515/294-2501.

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May 1, 2000 p5

Document 19 of 370

### Leaders in Facilities Maintenance Management.

(Industry Trend or Event)

**Author**

Harwick, Tom

**Related Information**

■ Companies

■ Products

■ Topics

**Full Text**

Catalyst:

Client inquiry

Question:

Who are the leading software providers for facilities **maintenance** management and preventive **maintenance**?

Answer:

The **maintenance** management software market is at approximately \$900 million and is expected to exceed \$1.88 billion by 2002. Drivers include a highly competitive business environment that seeks greater efficiency through cost controls, elimination of unplanned production downtime, migration to scalable solutions and packaged third-party software, and **maintenance** workforce automation. The market spans Fortune 1000 corporations, process and discrete manufacturers, government agencies, universities, hospitals and other organizations that maintain high-value capital assets such as plants, facilities and production equipment.

This is a very fragmented field. Giga is aware of more than 100 providers. They range from highly packaged software applications to services companies, which have code libraries that they reuse for projects. Vertical applications provide for preventive **maintenance** of real estate, manufacturing plants, telcom networks and electronic equipment. A representative sample of the more prominent providers of packaged applications includes:

Datastream Systems Inc. ([www.dstm.com](http://www.dstm.com)): With more than 50,000 installations in 129 countries, Datastream Systems is the market leader in **maintenance** solutions. Datastream markets its **maintenance** solutions to the manufacturing, hospitality, health-care, transportation, telecommunications and facilities sectors and to government agencies. Datastream offers a range of **maintenance** software products, from entry-level **maintenance** solutions to Internet and client/server-based solutions aimed at large multisite and multinational clients. Features include a flexible security system, sophisticated analysis and reporting capabilities, and a complete set of tools for managing work orders, equipment histories and inventory information. The product also offers innovative features such as multitasks, purchasing, audit trail, statistical predictive **maintenance**, asset management,

budgeting service requests, multiple wage rates and failure analysis tracking. The system has an open systems architecture that allows rapid deployment with enterprise resource planning (ERP) systems, equipment monitoring devices, handheld computers, barcode scanners and virtually any other data source. The software is available in seven languages and supports multiple languages concurrently. It can be configured for a browser-based interface for Internet/intranet access or for traditional client/server architectures.

Ivara ([www.ivara.com](http://www.ivara.com)): A new and innovative entrant to the field, Ivara was founded in 1997 and uses Web-based and analytical technology to offer a high value **maintenance** management application to large and midsize (\$100 million and up) discrete and process manufacturers. Its Enterprise Asset Management (EAM) application provides typical EAM functionality such as work order tracking, preventive **maintenance** scheduling, MRO inventory management, procurement management and personnel management. EAM is integrated with the Ivara Expert **Maintenance** Program, which acquires equipment status data via electronic data acquisition, handheld devices or desktop entry, and processes this information via a rules engine to develop predictive, rather than merely time-based, preventive **maintenance** schedules. In addition, Ivara supports a browser-based architecture that enables sharing of **maintenance** data, information, and decisions across multiple plant locations.

Project Software and Development Inc. (PSDI) ([www.maximo.com](http://www.maximo.com)): PSDI markets MAXIMO, an enterprise asset management package designed to reduce downtime, control **maintenance** expenses, cut parts inventories, improve purchasing efficiency and increase the productivity of assets, people and other resources. PSDI targets enterprises that need to maintain high value assets, such as plants, facilities and production equipment, such as utilities, manufacturers, governments, universities and hotels. MAXIMO has been installed at more than 5,500 sites. In addition to its EAM product, aimed at large manufacturers, the MAXIMO family includes solutions aimed at smaller players doing plant management, facilities management and fleet management as well as an MRO-oriented trading exchange and e-procurement solution.

Western Pacific Data Systems (WPDS) ([www.wpds.com](http://www.wpds.com)): WPDS is a good example of a vertical provider, serving the aerospace sector. WPDS' product, GOLD, is designed for the **maintenance** and repair of equipment including **aircraft**, communications and electronics systems, radar systems, missiles, rockets, vehicles and other complex systems. Its customer base includes aerospace manufacturing and leading US defense contractors, in addition to the US Army, the Navy and Air Force, and foreign military sites. GOLD is a comprehensive property management system for the interrelated functions of asset and inventory management, depot repair and modification of repairable components, and equipment calibration and **maintenance**. GOLD offers a repair-oriented approach to generating a factored bill of material, forecasting material requirements, tracking torn-down jobs, accommodating flexible repair routings, and highlighting pacing production problems through online inquiries and exception reports.

TSW International/Indus International Inc. ([www.tswi.com](http://www.tswi.com)): TSW targets large facilities or plants with 50 or more tradesmen in the **maintenance** organization. The Indus PASSPORT software is an asset care solution aimed at process and discrete manufacturers as well as companies in power generation, telecommunications, transportation and public sector. Indus has been successful for many years in selling into very large asset intensive companies such as Unocal, Pratt & Whitney, NextWave, Ohio Edison, CSX, Alcoa, OCI Chemicals and Hong Kong Airport. It has been or is being installed in more than 500 major facilities worldwide. PASSPORT is a



suite of modular applications designed to meet the needs of managers and plant staff at manufacturing and process facilities by providing enterprise information management. At the core of each solution is a data hub serving as a comprehensive portfolio of modular baseline application systems. The applications include: work management, inventory and warehousing, purchasing, document and engineering management, financials and various health and safety and regulatory compliance applications (material safety data sheets, fugitive emissions). PASSPORT does not claim to provide preventive **maintenance** support.

Fluor Daniel Inc. ([www.fd-fps.com](http://www.fd-fps.com)): A global service organization specializing in management, engineering, construction and **maintenance** services, the Fluor Daniel software division was formed to leverage Tabware, a **maintenance** management application originally developed for use within Fluor. Tabware is being marketed to process industries, including chemical, energy and oil and gas. Tabware is a client/server package capable of integrated work process management, event tracking, preventive and predictive **maintenance**, inventory control and full multilingual support.

Carl International ([www.carl-intl.fr](http://www.carl-intl.fr)): A leading French provider of **maintenance** and asset management systems, its solution is designed for firms that maintain large facilities such as buildings, production equipment, warehouses and fleets. The application is designed to control costs, improve equipment availability and resource utilization. The software can be used to manage construction projects, rebuilds, breakdowns and preventive **maintenance**.

#### Recommendations

Clients that operate large and complex facilities need to invest in **maintenance** management software in order to control costs and improve the ability to serve customers (patients, students) by ensuring that facility availability is maximized. The need is greatest in manufacturing, where production equipment is often self destructive, is expensive to fix, and can be a significant stumbling block to customer service. Custom and semi-custom systems are not recommended -- **maintenance** management has a high degree of commonality across major categories, such as manufacturing equipment and buildings and grounds. The large providers have embedded best practices in their applications and provide a better solution than can be had by building a custom system based on user desires to enshrine current practices.

The lower-end solutions tend to be transactional in nature -- managing work orders, service parts and schedules. The higher-end solutions can add much more value to organizations large enough to justify the cost. Large organizations need to look for preventive **maintenance**, rules-based equipment analysis, electronic data collection and Internet-based deployment capability in order to get maximum benefit from their **maintenance** management system.

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#### Related Information

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DIALOG(R)File 275:Gale Group Computer DB(TM)

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01937456 SUPPLIER NUMBER: 18283724 (THIS IS THE FULL TEXT)

**All around the world. (Pratt & Whitney plans global upgrade; hires Vanstar as outsourcer) (PC Week Executive) (Company Business and Marketing)**

Moad, Jeff

PC Week, v13, n19, pE1(3)

May 13, 1996

ISSN: 0740-1604

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WORD COUNT: 1569

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**ABSTRACT:** Pratt & Whitney plans a worldwide upgrade of its IT infrastructure and hires Vanstar to carry out the planning, acquisition and deployment, signing a selective outsourcing agreement worth \$2.7 million. The agreement illustrates the increasing importance of global outsourcing services, as more companies seek to standardize their IT equipment so that all offices can use the same business practices and deliver consistent service. Pratt & Whitney wants its upgrade to be finished within six months and wants each of its 86 offices in 45 countries to be down no more than 48 hours. Pratt & Whitney awarded Vanstar the contract because Vanstar demonstrated that it had good knowledge of local customs and because it had a strong support network. Cost was not a deciding factor, since most bids fell into the same range. Pratt & Whitney and Vanstar will begin deploying the upgrade in May 1996.

**TEXT:****Drill Down**

Outsourcing can make global deployment a less earth-shattering experience.

Joe Muldoon isn't the type of guy who dwells on the negative. But lately the field office support team leader at Pratt & Whitney can't stop thinking about the time recently when a PC on its way to the company's Rome office fell off the delivery truck and ended up in the middle of the street, flat as a pizza (extra sauce, no anchovies).

It wasn't funny to Muldoon. Because Pratt & Whitney's PC vendor had no dealership in Rome at the time, local Pratt & Whitney employees had to scoop up the shattered machine and ship it back to the company's East Hartford, Conn., headquarters for repair and replacement. "It was a major nightmare," remembers Muldoon.

The memory of that bad dream is sticking with Muldoon these days because he and Pratt & Whitney are about to embark on an ambitious, global IT infrastructure upgrade that could, if Muldoon's not careful, easily end up in ruins.

Pratt & Whitney, a \$6.2 billion unit of United Technologies Corp., which makes **aircraft** engines, is replacing all of the 8-year-old PS/2 Model 55 desktop machines, servers, LANs, system **software** and many of the applications used by its support engineers in 86 offices spread across 45 countries.

**48 Hours**

As if that weren't challenge enough, business managers at Pratt & Whitney have told Muldoon they want the global upgrades to be done over a period of just six months, and they want deployment at each individual office to take no more than 48 hours.

"The idea is to avoid major disruptions to the business and to avoid a situation where one office has the new equipment a year before another," says Muldoon. "That kind of thing can create dissension in the ranks. But getting it done is going to be a major challenge."

Not surprisingly, Muldoon has decided to look for some outside help. In February, Pratt & Whitney signed a \$2.7 million selective outsourcing agreement calling for Vanstar Corp., of Pleasanton, Calif., to take over planning, acquisition and global deployment of the new IT infrastructure.

The deal is the first of its kind for Vanstar, which, like many vendors of network asset management services, is just beginning to provide global support. Earlier this year, Vanstar announced what it calls its Global Enterprise Services offering and an alliance with Groupe Bull, which will help Vanstar provide deployment services worldwide.

#### Spanning the Globe

"Outsourcers are starting to make a major push to provide global deployment services because they recognize that many companies want the same IT equipment on every desktop worldwide so they can share common business practices and deliver consistent service," says Joseph Pucciarelli, research director at Gartner Group Inc., in Stamford, Conn. Pucciarelli predicts that up to 70 percent of organizations attempting major global desktop and network deployments will use outsourcers. "It's very, very difficult to pull off," he says.

So difficult that Pratt & Whitney delayed its global upgrade as long as possible. The company's field support engineers are deployed at airports and other facilities where Pratt & Whitney customers such as airlines maintain **aircraft**. Pratt & Whitney's field engineers care for engines in 6,500 commercial **aircraft**. Among the more remote locations: Perm, Russia, and Abu Dhabi in the United Arab Emirates. There Pratt & Whitney engineers provide **maintenance** and repair information and assistance and keep track of engine reliability reports.

The key application they use, called the Computer-Aide Drawing Retrieval System, allows engineers to download from Pratt & Whitney legacy servers updated engine part blueprints and design information. The PS/2 55s currently use Synchronous Data Link Control communications and 3270 emulation. Reliability reports are E-mailed to headquarters, where they are manually entered into a **database**.

#### Better Service

Pratt & Whitney's plan is to upgrade those systems to improve customer service. One new application will provide parts manuals and catalogs on local CD-ROMs. Another will allow support engineers to directly update a central, Oracle-based reliability report **database** over the network from graphical front ends written in PowerBuilder.

To support those applications, however, Pratt & Whitney needs to upgrade field desktops to Windows-based multimedia Hewlett-Packard Co. Vectra Pentium machines and install frame relay and IP networking. Larger remote offices will get NT servers.

Just getting the new equipment installed and running in 86 offices worldwide will be a major challenge, however. For one thing, Pratt & Whitney faces different customs regulations and forms in each country. There will be different sets of shipping charges, duties and value-added taxes at each location. Even finding the local office will be a challenge because Pratt & Whitney uses its customers' buildings. At each site there will be more surprises, such as strange wiring or weird connectors requiring time-consuming workarounds. All of those details will have to be tightly managed.

"It's as difficult a global deployment as I've ever seen," says Dick Roe, global manager on the Pratt & Whitney project for Vanstar, in Vienna, Va. "The shipping addresses may be different from the street addresses. In some cases there are no street addresses. The challenge will be to get consistent information to the people in the field."

Muldoon estimates it would take his eight-person department 12 to 18 months to complete the global deployment. "Obviously, that wasn't going to fly," he says.

That's when Pratt & Whitney started looking for an outsourcer. In June the company invited eight outsourcers to bid on the global installation. In addition to requiring the six-month deployment schedule, Muldoon insisted vendors agree to repair failed equipment during the initial warranty period. Of the eight outsourcers originally solicited, only four responded with a formal bid.

"Many of them were just in the process of setting up their global support organizations," said Muldoon. "Frankly, several of them simply didn't have the wherewithal yet to do the job."

### Money Changes Everything

Cost was not the make-or-break issue when Pratt & Whitney began to choose from among the four bidding vendors. "They were all pretty much in the same ballpark on money," says Muldoon.

Local knowledge and the breadth of its support network proved to be Vanstar's advantage, says Muldoon. "They had a very impressive affiliate network, and their bid reflected some detailed knowledge of the issues we'd be facing at different locations." Vanstar's itemized bid, for example, showed higher costs for implementation at Pratt & Whitney's office, in Bombay, India, where tariffs are high, and complex bureaucratic regulations can drive up costs. "That showed us they knew the territory," says Muldoon.

Pratt & Whitney's decision to emphasize local knowledge when **evaluating** global deployment outsourcers was the right one, says Gartner's Pucciarelli. "It's imperative for IT managers to understand what the service provider can really do. You've got to really test the vendor. Find out how many people they have in each local office and what their experience is," says Pucciarelli. "Get the names of the vendor's local people and check them out with other customer references. Find out if they can really deliver or if they just have aspirations to deliver."

Muldoon will soon find out if he's made the right choice. Pratt & Whitney and Vanstar will begin the global deployment at the end of May. They've already flushed out some bugs. In March, Pratt & Whitney and Vanstar set up a simulated overseas office in Atlanta where they attempted to do the upgrade. Going in they were most concerned about the complexity of setting up Windows NT domains and security IDs. The real problem, however, turned out to be simply migrating files from the PS/2s to the new Vectra desktops.

### A Messy Job

"Some of those files hadn't been cleaned up in years," says Muldoon. "In some cases it took us 7 hours just to transfer files because of the sheer volume." Pratt & Whitney and Vanstar ended up writing scripts to clean up the files before migrating them to the new machines.

In the meantime, Vanstar has been creating some technology of its own that should be a big help once the global deployment gets rolling: a central **database** of information about each Pratt & Whitney site that will be replicated and made available to deployment personnel around the world. The **database** will tell local installers not just what new equipment to set up but also about the physical characteristics of the office they'll be working on, such as wiring details and location.

The **database** also will include equipment delivery details downloaded from Federal Express, which will be hired to move most of the equipment.

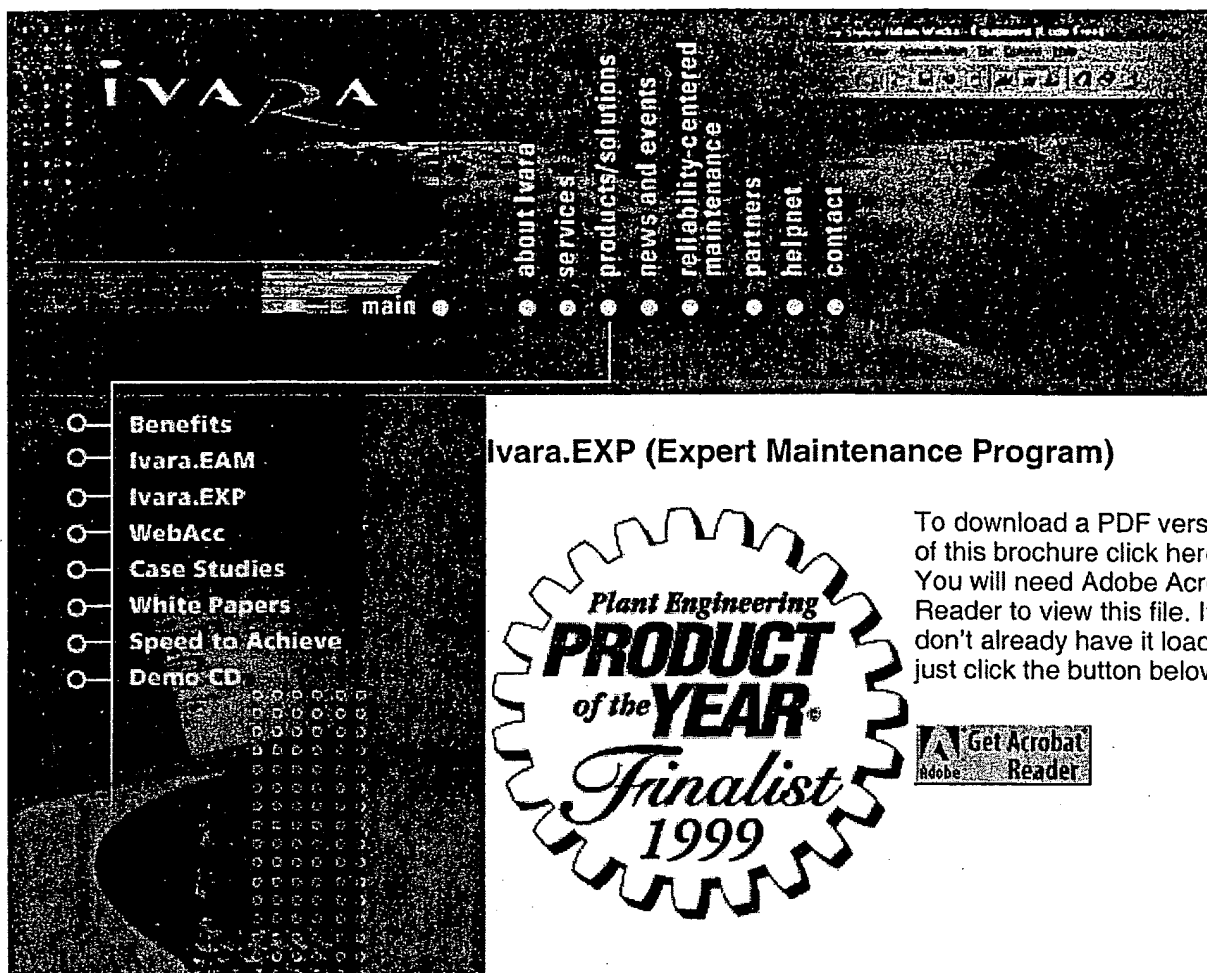
With that **database** and plenty of local knowledge in place, Muldoon and Pratt & Whitney should have a good shot at pulling off a complicated global upgrade. If, that is, they can keep the computers strapped to the trucks.

Senior Editor Jeff Moad can be reached at jeff--moad@zd.com.

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COMPANY NAMES: Pratt and Whitney--Contracts; Vanstar Corp.--Contracts  
DESCRIPTORS: Contract Agreement; Outsourcing  
PRODUCT/INDUSTRY NAMES: 3721000 (Aircraft); 7370000 (Computer Services)  
SIC CODES: 3721 Aircraft; 7370 Computer and Data Processing Services  
FILE SEGMENT: CD File 275

8/9/9



## Ivara.EXP (Expert Maintenance Program)

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### Why Ivara.EXP

Ivara.EXP - Helping you do the right work at the right time

- Increase the use of predictive techniques
- Capture maintenance expertise
- Ensure equipment performs within its desired operating parameters
- Predict equipment failure before it occurs
- Avoid unnecessary replacement of costly parts
- Take full advantage of Pdm systems
- Make informed maintenance decisions
- Have ready access to equipment condition
- Easily integrates with your existing applications
- Proven solution that delivers significant benefits

Today's competitive environment is placing increasing demands on the management of physical assets. Traditional CMMS systems have helped companies improve the efficiency of maintenance work execution, but have focused on corrective and preventative maintenance approaches. Technological advances in the areas of Reliability Centered Maintenance (RCM), Predictive Maintenance, Condition Monitoring and Expert Systems are making a new approach to maintenance possible. Leading organizations are taking advantage of the convergence

of these technologies to implement more proactive maintenance programs to improve the profitability of their organizations.

Ivara.EXP is an Expert Maintenance Program that improves the effectiveness of maintenance by identifying the right work to do at the right time. It allows organizations to define, implement and manage effective and proactive maintenance programs. Ivara.EXP includes specialized functionality in the areas of:

- Asset Hierarchy and Criticality
- Reliability-Centered Maintenance Analysis
- Equipment Maintenance Program Development
- Equipment Condition Monitoring
- Route Construction
- Collection of Equipment Indicator Values
- Expert Systems Diagnostics
- Equipment Performance Analyzer
- Audit Trail

*(Click on any image for a larger view)*

### **Asset Hierarchy and Criticality**

In order to properly track your equipment you need to ensure you have an equipment hierarchy that goes to the level of detail of components that you perform maintenance on. Ivara.EXP is organized into hierarchies with unlimited levels. It supports multiple hierarchies and component tracking.

You also need to know the criticality of your equipment in order to develop effective equipment maintenance programs for them. Ivara.EXP helps you to assess which equipment is most critical and develop an equipment maintenance program that takes this criticality into account.

### **Reliability-Centered Maintenance Analysis**

RCM2 enables efficient and accurate record keeping of all RCM analyses and includes the decision criteria to answer the following seven questions that are required to complete an RCM analysis:

1. Function: What is the function of a piece of equipment and associated standards of performance?
2. Functional Failure: In what ways can the equipment fail to perform its function?
3. Failure Modes: What causes each failure mode?
4. Failure Effect: What happens when each failure occurs?

7. Failure Effect: What happens when each failure occurs?

5. Failure Consequences: In what way does each failure matter?

6. Proactive Tasks: What should be done to predict or prevent each failure?

7. Default Actions: What should be done if a suitable proactive task cannot be found?

In order to take full advantage of the RCM capabilities within Ivara.EXP you do require the RCM 2 Toolkit.

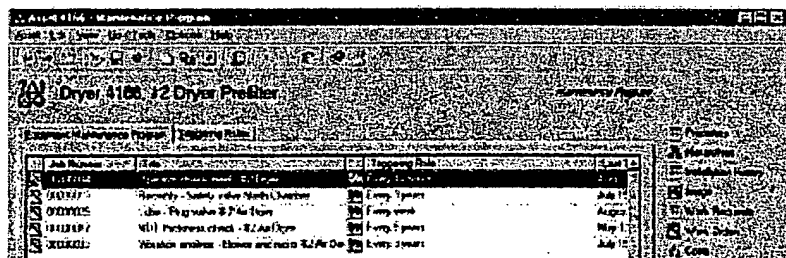
Ivara.EXP supports the implementation of RCM analyses by ensuring:

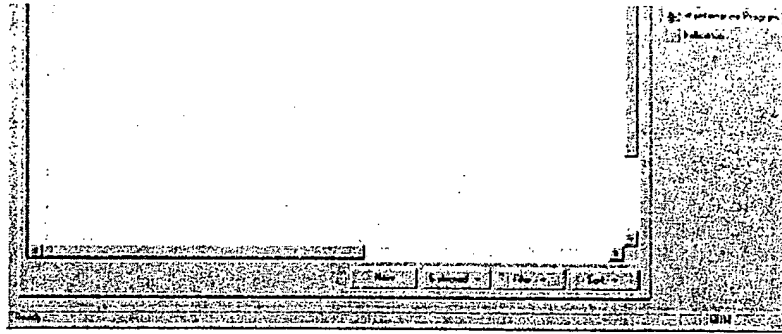
- **Ease of RCM Implementation.** Ivara.EXP integrates with the RCM 2 Toolkit to ensure that the tasks that have been identified in the RCM analysis are part of your Equipment Maintenance Program and that those tasks are scheduled and carried out.
- **Visibility of RCM Information.** Ivara.EXP allows everyone to see the technical basis for the tasks that have been identified. They know that by performing a task they are addressing a specific failure mode and can see the importance of the task.
- **Ongoing Synchronization.** By integrating with the RCM2 Toolkit, Ivara.EXP provides an audit to ensure that changes made in the RCM2 Toolkit are reflected in Ivara.EXP. Conversely, if changes to an RCM task are made in Ivara.EXP you will be notified so that you can revisit your RCM analysis to make appropriate changes.

### Equipment Maintenance Program (EMP) Development

The EMP identifies all the maintenance programs, including predictive, preventive and corrective maintenance activities that are done for each piece of equipment. These maintenance activities are derived from the completed RCM analyses, PdM needs assessments and best practice reviews.

### Equipment Condition Monitoring



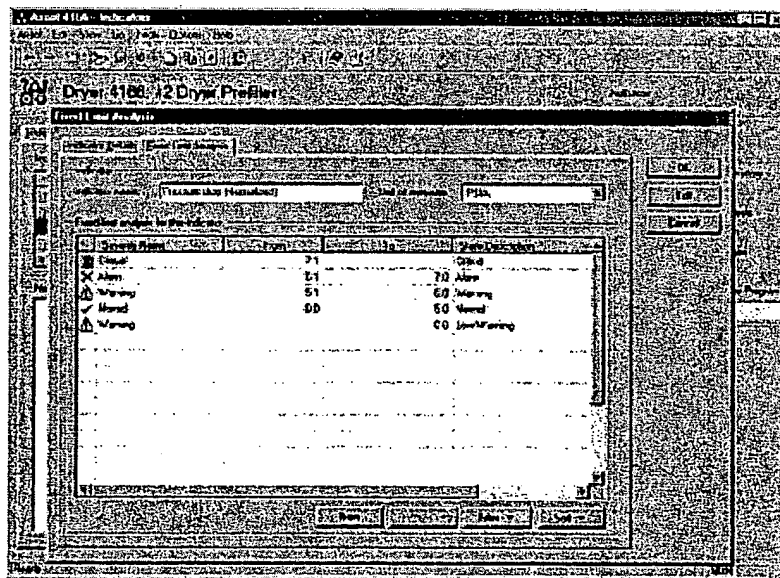


Equipment Condition Monitoring identifies the equipment condition indicator to be collected, the frequency and the method for collecting the condition indicator values

### Route Construction

Ivara.EXP helps you to organize activities for multiple assets into efficient routes. This ensures coverage of all the activities. Ivara.EXP allows you to select activities by frequency, department, trade, and activity type and has lag time support. These routes can be performed by maintenance through a work order or by operations without a work order.

### Collection of Equipment Indicator Values



The collection of Equipment Indicator Values is done through integration with data acquisition products such as PI Systems, integration to PLCs, DCSs, and integration to existing or new predictive maintenance technologies such as vibration analysis, oil analysis, motor circuit analysis and thermography. For equipment where sensors have not been installed and for the collection of inspection data, the values can be easily entered directly into the product or recorded on hand held data collection



available in a number of formats such as trending so the maintenance personnel and equipment operators can review the condition of the equipment. The recommended maintenance activities based on the overall health of the equipment are identified. A standard work order for the recommended maintenance activities is easily generated.

### **Audit Trail**

Ivara.EXP ensures that all of the processes and practices of your equipment maintenance program are followed. All alarms must be acknowledged and either dismissed with a reason or have corrective work initiated. It will then track the status of all initiated work so that you know where things stand. You also have control of your alarm limits so that they can be managed if something changes with your equipment such as the operating context.

### **Implementing Ivara.EXP**

The Ivara.EXP System can be integrated with existing CMMS applications or it can be used as part of the total Ivara Enterprise Asset Management solution.

You can take advantage of Ivara's experienced consultants, implementation methodology and predefined maintenance programs to achieve the benefits of Ivara.EXP quickly.

Ivara.EXP supports Windows 95/98/NT clients and SQL Server and Oracle database servers.



A-Z SOLNS

SITEMAP

SEARCH

ABOUT

HISTORY

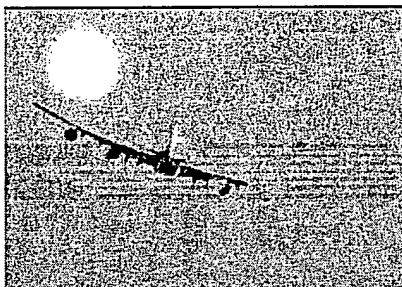
SOLUTIONS

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## Ground Maintenance & Engineering

### GOLD Overview



#### SOLUTION DESCRIPTION

GOLD SUBSYSTEMS  
LINE MAINTENANCE  
INTERMEDIATE AND HEAVY MAINTENANCE  
SUPPLY/MATERIAL  
ASSET SYSTEM  
CALIBRATION SYSTEM  
TECHNOLOGY

#### Y2K COMPLIANCE STATEMENT

### Solution Description

GOLD Integrated Maintenance and Supply Software from SPIRENT Systems (La Jolla) is a comprehensive suite of modules initially developed in 1981 to meet the exacting requirements of aerospace defense contractors and government organizations.

It has evolved into the most powerful end-to-end solution available for product-support, supply, maintenance, remanufacturing, MRO (Maintenance, Repair and Overhaul) refurbishment and modification requirements. GOLD includes systems for:

- Configuration Management and Maintenance
- Work Management and Recording
- Replenishment
- Supply/Material Management
- Foundation Subsystems

Multiple modules within these Systems provide the most comprehensive and robust commercial-the-shelf (COTS) product available today for integrated logistics support.

### Subsystems

#### Line Maintenance

Also known in the military as "O Level maintenance" and by commercial airlines as "line maintain this subsystem is designed to maintain equipment (i.e. aircraft) at the flight line or place of deployment. Capabilities include planned maintenance scheduling, work order recording, configuration management, fault recording, compliance with bulletins/technical directives, life of equipment, reporting of failure data to analysis systems.

#### Intermediate and Heavy Maintenance

Also known as Intermediate and Depot Level Repair (heavy maintenance or "letter checks" for commercial airlines), these subsystems are designed to repair subassemblies that have failed at line.

GOLD's Intermediate and Heavy Maintenance subsystems provide the ability to induct items into repair, tear down and track subassemblies, and prioritize jobs throughout the entire repair process. GOLD provides unique tools specific to repair facilities that are designed to help shorten repair time and provide management reports of current and past performance.

### **Supply/Material**

GOLD's Material System is tightly integrated with all the Maintenance subsystems providing Inventory Control and Management. Capabilities include Warehousing, Ordering, Kitting, Purchasing, Receipt Inspection, Shipping, Backorder management and more. GOLD has unique forecasting tools to optimize stock levels, designed to minimize stock while providing the parts needed at the correct locations.

### **Asset System**

GOLD's Asset System is designed to track and manage the support equipment typically required for maintenance and repair facilities – tooling, test equipment and ground support equipment. The Asset System is also used to manage corporate or organization assets such as computer equipment, heavy machinery, and other capital equipment.

### **Calibration System**

The GOLD Calibration System is designed to support the special needs of a metrology department. Functions include calibration and maintenance scheduling, fault recording and work order recording. Unique requirements of a calibration lab are supported including tracking standards, providing full traceability and automatic interval adjustment.

### **Technology**

GOLD incorporates open, leading-edge technology through a client-server architecture and a graphical user interface. The system supports a wide range of databases and operating systems, and can run on all versions of MS Windows, as well as Macintosh, OS/2, X-Windows, and others.

Detailed information about each GOLD subsystem, its functionality and technology is provided on our website. See **GOLD Technology** and **GOLD Functionality**.

**BACK TO TOP**

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July 14, 2000

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## **MPXconnect**

MPXconnect establishes Datastream as the global EAM Application Service Provider. Datastream and its data center partner unite to deliver complete EAM application - handling all software, hardware, and support concerns.

Simply subscribe to MPXconnect, define your implementation and user training plan with Datastream's professional services group, and begin developing data and deploying your EAM application.

### **MPXconnect Modules:**

- **Asset Management** - Access comprehensive analysis and cost history and capture, monitor, control and analyze all asset relationships-including warranties. Monitor and track the registration, movement and location of all corporate assets.
- **Work Management** - Create, plan and schedule work orders
- **Materials Management** - Maintain materials inventory by ordering and receiving materials, transferring materials among stores, issuing reserved and purchased materials, and receiving returned unused materials.
- **Inspection Management** - Plan, execute and control all inspection and predictive maintenance work.
- **Project Management** - Control the complete project process from initial budget and time-scale planning to the completion of the final work order.
- **Purchasing Management** - Create purchasing contracts, request quotations from suppliers, and generate purchase orders and blanket orders. Access iProcure, the leading industrial procurement network on the Internet.
- **Budget Management** - Monitor internal and external resources, stock material, fixed-price hired resources and direct material usage.
- **Reports Management** - Effectively manage capital assets and staff resources via customizable graphs, reports and tables

MPXconnect offers complete scalability to meet any user needs, and it reduces the total cost of deployment and ownership by outsourcing infrastructure costs. The reliability and protection of your mission-critical data is guaranteed with Datastream's state-of-the-art data center, which uses the most advanced security measures available.

Datastream's MPXconnect allows you to focus on running your plant instead of your maintenance software.

**MPXconnect****MP5****MP2****iProcure****customer profiles****euro information****white papers****local information**

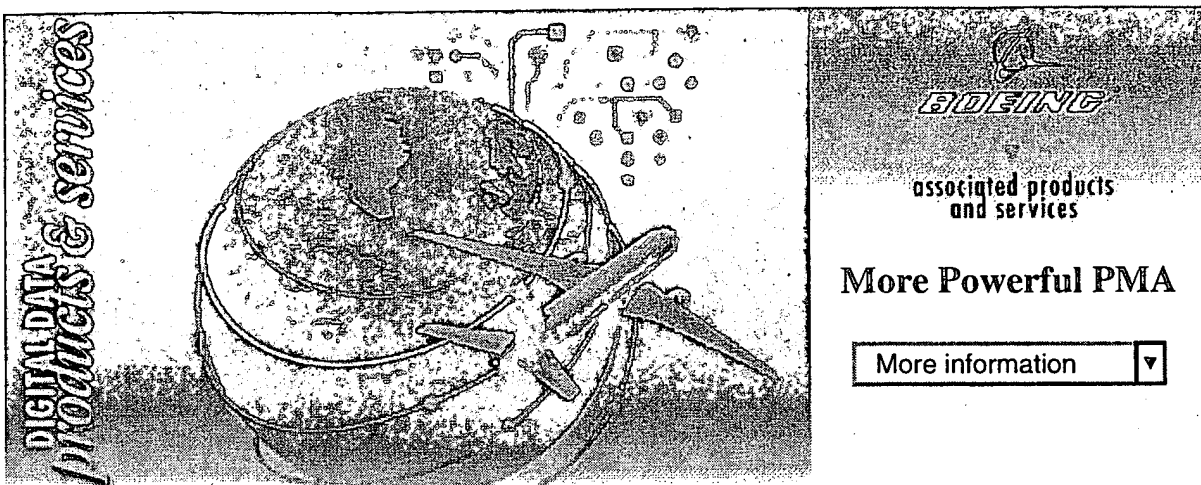
**System requirements**

- Internet Explorer 4.0 with SP2 or Netscape Navigator 4.05
- Win 95 or NT 4.0 or Macintosh
- A telecom or internet connection to the Datastream data hosting center
- Adobe Acrobat Reader 4.0

*Last Modified: Monday July 10 2000*

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top



### Boeing to Launch More Powerful Version of Portable Maintenance Aid

The Boeing Company's advanced digital troubleshooting aid for aircraft mechanics will soon become an even more powerful and indispensable tool. The Portable Maintenance Aid (PMA), first introduced three years ago, is software containing key maintenance documents, including the Fault Isolation Manual, Aircraft Maintenance Manual and Aircraft Illustrated Parts Catalog. Available on compact disc, it transforms a computer (laptop or desktop) into a complete technical library right at the user's fingertips regardless of the environment.

PMA streamlines the troubleshooting process by eliminating time consuming and often repeated trips to the airline's reference library. PMA also reduces research time by providing the mechanic and engineer with advanced search capabilities and easily accessible on-line manuals. Once the mechanic or engineer finds the specific topic they can jump directly to text or graphic by simply pointing-and-clicking on an embedded hyperlink. Extensive hyperlinking embedded in all of the on-line manuals helps the mechanic and/or engineer rapidly retrieve other related information.

Now, thanks to Boeing's leading edge intelligent graphics technology and more user-friendly features, PMA's capabilities will be substantially enhanced. Intelligent graphics improves navigation within graphic-based Fault Isolation Manual procedures (particularly 757, 767 and 747-400 FIMs). Text included in the Aircraft Maintenance Manual (AMM) and FIM graphics can be identified using the text search function. The new PMA 3.0 version, scheduled for release in mid-1999, will also be Year 2000 compliant.

PMA 3.0 users will also appreciate a new, easier to use browser-based interface. Other features include more extensive hyperlinking, greater flexibility in how information is distributed and presented, and a more robust architecture that will accommodate a suite of future Boeing digital products.

News Release - February 16, 1999

We welcome your comments. For more information, please [contact us](#).

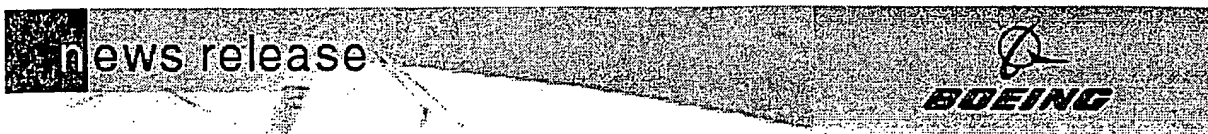
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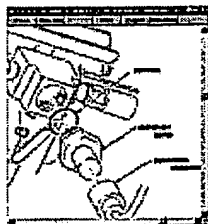
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## Airline Demand for Boeing's Portable Maintenance Aid Grows 100 Percent -- *New, More Powerful Version on the Way*



SEATTLE, Feb. 16, 1999 -- Airline demand for The Boeing Company's advanced digital troubleshooting aid for airplane mechanics shot up 100 percent in 1998, Boeing said today. In 1998, the number of airlines either using the Portable Maintenance Aid, or signing letters of intent to do so, jumped from 47 at the beginning of the year to 95 by year's end.



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[www.boeingmedia.com](http://www.boeingmedia.com)

The Portable Maintenance Aid (PMA) puts an entire technical library of key maintenance information in a laptop computer that a mechanic can carry directly to the airplane. All the information needed to perform maintenance and return an airplane to service in the minimum time is at the mechanic's fingertips.

This digital tool streamlines the troubleshooting process by eliminating time-consuming and repeated trips to the crew room or airline reference library to look up maintenance data in paper manuals or on microfilm readers.

Boeing also announced today that the Portable Maintenance Aid will soon become an even more powerful and indispensable tool. The PMA version 3.0 -- scheduled for release in mid-1999 -- will include the company's leading-edge, intelligent graphics technology to enhance user navigation, as well as a browser-based interface.

Other features in version 3.0 include more extensive hyperlinking, greater flexibility in how information is distributed and presented, and a more robust architecture that will accommodate a suite of future Boeing digital products.

Though originally designed as a line mechanic's diagnostic tool when it was first introduced three years ago, the Portable Maintenance Aid is also very useful to airline engineers, who rely on its full electronic cross-referencing and powerful search capability to help them complete numerous engineering tasks. PMA provides mechanics and engineers with quick, easy access to the contents of the Aircraft Maintenance Manual, Fault Isolation Manual, Illustrated Parts Catalog, and other critical information.

"The Portable Maintenance Aid has proven itself with Canadian Airlines," said Ken Goosen, vice president of Engineering and Maintenance at Canadian Airlines. "We are using PMA in our maintenance operations in

Vancouver and Toronto. We recently added Bangkok and Hong Kong as PMA stations, and with the ongoing improvements to PMA, we plan to use it system-wide in the future."

Canadian Airlines was one of the airlines that led the operational, test and evaluation trials of the Portable Maintenance Aid.

"We're always looking for new ways to add value for our customers, and we're delighted that airlines are finding our Portable Maintenance Aid an important productivity tool in their daily operations," said Brad Cvetovich, Boeing Commercial Airplanes vice president - Customer Support. "We're looking forward to providing even more functionality and value in the new version we'll introduce later this year."

More information on Boeing digital data products and services for airline customers can be found at either of the following URLs:

<http://www.boeing.com/digitaldata/>

[http://www.boeing.com/commercial/aeromagazine/aero\\_05/ps/ps01/](http://www.boeing.com/commercial/aeromagazine/aero_05/ps/ps01/)

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1

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### **F r the DoD, ADC technology is SOP - Finding an engine for a Navy aircraft? Vehicle maintenance across the globe? A suite of ADC technologies will improve all facets of logistics.**

(Government Activity)

**Author**

Krizner, Ken

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It's the responsibility of the Defense Logistics Agency (DLA) to get supplies and equipment to the troops when they are ordered to Somalia, Yugoslavia or other potential crisis points around the world.

According to the agency, "If our forces fight with it, wear it, eat it, burn it as fuel or otherwise use it, DLA probably provides it, arranges for its re-utilization after the consumer no longer needs it, or has managed the contract to obtain it." It's for this purpose that the DLA- the logistics support agency of the Department of Defense (DoD)-invests heavily in automatic identification technology (AIT).

The need for AIT, the DoD's terminology for automatic data capture technology, will continue to grow in the coming years. Not only is the DLA searching for new ways to implement AIT in the supply chain pipeline, but AIT can also help with a new DoD purchasing philosophy brought about by downsizing.

The DoD is teaming with vendors to hold certain stocks for the department. Contractors will retain more inventories, except for those in the hands of operational forces.

"We're going to be buying services-not equipment-in the future," says Tom Bruno, a senior analyst in the AIT office of the DLA. "This is where AIT can help us."

Bruno's responsibilities include researching, developing and implementing AIT for the DoD. He helped develop and implement data-rich radio frequency identification (RFID) tags on military equipment. RFID testing began following the Persian Gulf War and continued through such deployments as Somalia, Haiti and Kosovo. He believes there are no failures in implementing AIT "because you are always learning what you didn't know before." Rather than one technology, Bruno believes that a suite of technologies will allow for the maximum use of AIT.

In an interview with Frontline Solutions, Bruno talked about the increasing role that AIT will play in the DoD's future and how current AIT needs to be improved.

Frontline Solutions: In what area will the DoD try to improve itself using AIT?

Tom Bruno: The DoD's primary focus has been on distribution (supply and transportation) and reducing the number of days of supplies in the logistics pipeline. After the Persian Gulf War, the DoD developed an Intransit Visibility and Total Asset Visibility (TAV) AIT architecture. The DoD is now moving into the **maintenance**, ammunition health assessment, and hazardous material identification, laundry and tool- marking using a suite of AIT.

Ryder Truck, for example, uses contact memory buttons on its vehicles to assist in its logbook information. That's something the DoD is examining with aviation (helicopter, fighters and bombers) and vehicles (tanks, howitzers, Humvees).

All DoD property should be identified with some form of AIT. Every vehicle should be equipped with a contact memory button so we could have instant access to the engine and transmission serial numbers, last oil analysis results, parts on order for the vehicle, and general logbook information. This would give the DoD **maintenance** data on every vehicle before a unit gets ready to deploy.

The DoD could also update the contact memory button with what supplies, ammunition and hazardous material are being loaded into the vehicles, which would give the DoD access to that information with one touch. I can envision a bar code on the supplies and by scanning the item, the contact memory button can be updated along with a data-rich RFID tag.

FS: What needs to be done to improve AIT?

TB: The DoD needs to create a one-touch suite of AIT capabilities. Once the data is created-whether it's in the factory or from the vendor-we shouldn't have to re-key it anywhere along the logistics pipeline. That's one of the reasons why the PDF417 2D bar code was adopted. DLA depots could create the original source data, and the combination of supply and transportation information could be used at the aerial and sea ports. The processing times were dramatically reduced.

The DoD is trying to get enough information on a product that, as it goes through its life cycle, it would continue to have a unique identity. A lot of airplane parts have hazardous materials. It would be nice to have the data created at the factory so that when the part goes through the disposal process, the hazardous-material content is gone.

This goal is to allow the DoD to update the information on life- limiting components and have better configuration control of the end item. AIT can be captured and updated and will be the key to the DoD's successful implementation of logistics-knowledge bases.

FS: What other role will AIT play in the DoD's future?

TB: There is a paradigm shift occurring at the DoD. Since 1776, the military has purchased or manufactured its equipment and the DoD (and its predecessor, the War Department) has maintained the stocks of supplies. This is beginning to change. The new Marine Corps and Special Operations Command vertical takeoff helicopter will be 100% contractor- supported. The DoD will be measuring the performance of the vendor rather than the actual **maintenance** or supply-stockage level.

The DoD will also need effective interfaces with command-and-control structures of

distribution systems in theaters of operations to ensure that supply and transportation systems work together to provide timely delivery to deployed units. The only common input and capture technology is AIT. The data standards, the interoperability of being able to create source data, capture source data and view source data will be keys to continued contracting out of services.

FS: What criteria does the DoD use before committing to a new AIT system?

TB: The DoD has to first understand the problem, how big is the problem and develop a clear definition of the problem. AIT has reduced the logistic supply line from 49 to seven days because data can be scanned and read the first time. The DoD is working diligently in getting the correct data to the appropriate people at the appropriate time so they can make appropriate decision with the information captured from AIT.

FS: Can you show how AIT developed from an idea to actual implementation?

TB: Data-Rich RFID tags are an example. During Operation Desert Shield and Desert Storm, about 40,000 containers were shipped to the Persian Gulf. A lot of those containers never were opened in the desert because military shipping labels were damaged, destroyed or just weren't there.

After the Persian Gulf War, the DoD started testing RF tags as a possible solution. The Army determined that 128K of memory met about 97% of its requirements.

The Army tested the data-rich RFID tags going to Somalia (in late 1992). The data captured from the RFID tags were presented on two different computer screens: an IBM laptop, which had the content data, and an [Apple] Macintosh, which showed the Army where the containers were tracked at the node where an RFID interrogator had been established along supply chain pipeline. It was crude, but it gave the DoD more visibility than the Army had in the Gulf.

When Haiti came (in 1994), the Army integrated all of the capability and information onto one laptop. In 1995, the Army conducted "Drive Around Europe," which integrated satellite tracking with RF tag capability.

By the time of Kosovo (last year), the DoD had a vision of the data requirements and how to use PDF417, 2D bar codes, optical memory cards and data-rich RFID transponders. We used the AIT as a suite of technologies rather than one AIT technology.

The DoD Logistics AIT office was able to write an implementation plan because of the previous testing and evaluation.

FS: What other technology is in the DoD's future?

TB: Sensor technology coupled with AIT will play a bigger role in the future. If the DoD can predict when a repair part will be needed through health assessment sensors, for example, [it] can get that part into requisition and have it sent out to the appropriate person before it is actually fails.

The Navy is exploring the use of sensors with RFID tags to monitor the health assessment of the ammunition in the bunkers. There is [also] a need to monitor the seepage of hazardous material gases along the logistics pipeline, and sensors

provide this capability. FS

Frontliner: Tom Bruno

Title: Technical Adviser to the Department of Defense's (DoD) Logistics Automatic Identification Technology (AIT) Task Force.

Responsibilities: Studying and developing AIT-the DoD's terminology for automatic data capture technology-for the department. He works with all branches of the military, the Defense Logistics Agency and other agencies inside the DoD.

Private-sector background: Formed Bruno Associates in 1994, specializing in microcircuit technology in logistics applications. Past and present clients include Texas Instruments, Motorola, Bio-Tech and Oak Ridge National Labs.

Affiliations: Member of EIA, UCC, AIM, and ANSI MH10 and T6 standards committees.




Military career: A retired military officer, he was the integrated logistics support division chief at Army Material Command, and commanded armor units from platoon to battalion levels in Europe, South Korea and Saudi Arabia, as well as at Fort Hood and Fort Bragg. He retired with the rank of lieutenant colonel.

Education: A graduate of Infantry Officer Candidate School; Armor Basic Course, Field Artillery; Advanced Course, Air Force Command and General Staff College; and the DoD's Senior Logistics and Leadership Management Course.

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05028

**MRO GOING DIGITAL**

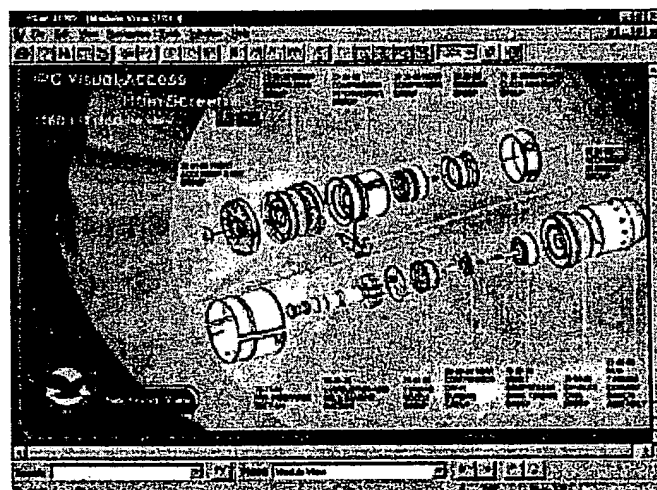
## Software Solutions Making MRO 'Smarter'

**MICHAEL MECHAM/SAN FRANCISCO**

**But the industry is conservative and has a 'show me' attitude to the many info-tech products it is offered**

Slowly and conservatively, the aerospace and defense sector is making a transition to interactive electronic business systems for its maintenance and repair operations.

The transfer to advanced computing tools varies widely by sector. Lack of common enterprise resource planning (ERP) software has slowed the introduction of e-business tools in the military. The maintenance, repair and overhaul (MRO) function goes by the name of shuttle processing at Kennedy Space Center and is highly specialized. Use of software to enhance MRO operations is growing most rapidly in the traditional maintenance and repair industry for commercial aviation. A study by consultants Frost & Sullivan said MRO has jumped from \$20.9 billion in 1997 revenues to an expected \$23.2 billion this year and should reach \$30.7 billion in 2006.



Paper manuals and microfiches are still common, but MRO is also developing its own .com business base. One company, PartsBase.com, lists 10,000 buyers and sellers and 37 million parts in its database. The company doesn't sell parts; it allows searchers to find who has what available. An auction service is expected to come on-line by October, Vice President Mark Eglington said.

**Enigma initially targeted engine makers for its electronic publishing software and has won contracts with Pratt & Whitney (shown), General Electric, Rolls-Royce and IAE.**

Aerospace has used electronic data interfaces (EDI) for ordering parts and accessing service bulletins for years, just as airframe, engine and component makers are gradually replacing their paper manuals, drawings and microfiches with floppy disks and CD-ROMs. "The next round is going to be the Internet," said SAP Vice President Nils Herzberg, who heads the German software maker's A&D business unit. "That seems pretty obvious. What comes after that, I don't know."

Most likely, it will be what MRO operators feel comfortable with and are willing to pay for. Maintenance firms know that information technology (IT) services help make them more efficient for training, shop floor logistics management and inventory control, Frost & Sullivan researcher Art Nishimura said. But the industry is conservative and has a "follower mentality" toward software innovation. "If somebody out in the field can show that [a software package] works, they'll follow like wildfire," he said.

American Airlines Vice President John McClain, who oversees the carrier's purchasing, emphasizes that software innovations also have to be cost-effective. American relies on an eight-year-old proprietary Walker system for its logistics operations. The system can forecast demand for parts, but it cannot match the planning capabilities of the SAP business software that American uses to run its financials. So why not install SAP in the maintenance shop? Because the cost/benefit ratio has not been proven, McClain said.

Another reason for conservatism, airline officials report, is that too many software solutions for MRO have been adopted from manufacturing applications and are not user-friendly for maintenance work.

A Booz, Allen & Hamilton study of the MRO market found on average 73% of worldwide maintenance work is performed in-house. That figure is down from 90% in the early 1970s. But U.S. airlines are bucking the trend--they still do an average 85% of their own work.

All but the most sophisticated maintenance providers outsource certain components, but "airframe and engine maintenance is jealously guarded by MRO labor unions," the Booz, Allen study concluded. Still, engine overhaul is a growth area for original equipment manufacturers (OEMs), who report their MRO work up 15%. The reason: today's engines require a whole new set of technology to maintain and are so reliable that they are off wing less frequently. A high initial investment for components that are less likely to break points many airlines toward an engine warranty contract with OEMs.

But SAP's Herzberg sees other forces behind the industry's conservatism, especially in North America. More European and Asian carriers are operating their MRO shops as independent business units rather than divisions of the airline, as is common in the U.S., he said. "I think the Europeans [and Asians] have discovered [MRO] as a business within itself, while the Americans are viewing it as a cost."

Cathay Pacific Airways, Singapore Airlines, Lufthansa, Swissair and Air New Zealand are examples of major carriers whose MRO activities are run as independent business units. Cathay and Singapore are in business partnerships with Rolls-Royce to provide engine services in Asia. Air New Zealand's outreach has extended as far as jet engines for the Australian air force. And Lufthansa has added business jet conversion work to its MRO shop activities.

AlliedSignal Aerospace President James D. Taiclet, Jr., sees the MRO industry as in a state of flux. "Airlines are getting focused more on asset management. They're becoming more efficient," he said. But U.S. carriers, especially, are still sorting out how much material to outsource.

**OEMs are expanding** their MRO infotech offerings. Boeing has been an industry leader with its Boeing On-Line Delivery (BOLD) system, Portable Maintenance Aid (PMA) and PART page electronic parts catalog and is actively seeking digital business opportunities, senior digital products manager William Shaproski said.

BOLD is the 24-hr. daily server/client system most familiar for offering drawings and backup data for every aircraft from the 707 to 777. With 73 customers and about 15,000 users, it is making 20 million transactions a year. Every Boeing customer with more than 50 aircraft has signed up.

By now, the system is also offering illustrated parts catalogs for about 90% of the components on Boeing aircraft. Early next year, Boeing expects to have the complete Douglas product line from the DC-9 through the MD-11 on BOLD.

Most customers access BOLD through EDI, although an X Window Unix application makes it accessible from the Web. But that Internet connection is slow. However, Web technology is advancing fast enough to move beyond the X Windows. "Very soon, we'll announce a new version of BOLD that will be Web-based," Shaproski said.

In another move later this year, Boeing will begin delivering aircraft maintenance manuals, the illustrated parts catalog, fault isolation manuals and structural repair manuals on-line in a portable document file (PDF). It expects its full product line to be in PDF by 2001.

Although PDF is far less capable than SGML (Standard Generalized Markup Language) used by BOLD and the Internet, its simple electronic reproduction of 2D pages from repair manuals are preferred by a majority of airline mechanics. "Our customers are conservative," Shaproski said.

Still, sometime after 2001 Boeing expects to introduce a more intelligent version of its SGML-formatted service bulletins that should match the format in its new Portable Maintenance Aid that appeared in June. PMA is a laptop trouble-shooting software that gives technicians complete manuals on the shop floor.

Its redesign incorporates a CD-ROM format, instead of floppy disks, and allows airlines to insert their own "pink" sheet maintenance standards alongside Boeing's specs. By early 2001, Boeing expects that customers will be able to receive PMA updates on-line, eliminating the need to ship disks every quarter. Shaproski expects to see 100 customers for the PMA by 2001, up from 34 currently.

One as-yet-unnamed Boeing program to be introduced by year's end will provide full wiring diagrams in the systems manual. Clicking on a wire will illuminate it so it can be traced throughout the aircraft. Clicking on a connector will produce its part number. Another innovation is a squawk-probability database that will list known solutions in order of probability for specific faults. A third offers automatic linkages to an airline's inventory control system to see if it has a part in storage.



**Rockwell Collins now receives users' component reliability data when they send in floppy disks, but it wants to begin gathering the data electronically.**

After three years of operation, Boeing's PART Page electronic catalog has a subscriber base of 936 companies and accounts for 37% of all parts ordered from Boeing. Still, most parts, 47%, are ordered by EDI, the rest through faxes or phone calls. The PART Page averages 18,000 transactions a day.

Tom DeMarco, systems director for Boeing's airline logistics support, said the company is developing a supplier's counterpart to PART. The goal is to include them in Boeing's database for analyzing the ordering cycles of parts so suppliers can shorten their lead times. Boeing's pilot project is underway with 33 suppliers and should be ready for launch early next year.

Airbus is working on its own electronic on-line MRO programs as part of the complete IT makeover the consortium has underway as it strives to become a single corporate entity (*AW&ST* Nov. 16, 1998, p. 64).

But the world's third largest aircraft maker, Canada's Bombardier, has staked its own claim to being an IT leader in MRO management. Within 18 months, Bombardier Business Aircraft expects its customers to be able to compare their own performance data with fleet-wide averages by using Bombardier's on-line database, Vice President Dave Orcutt said.

The company is evaluating the MRO ExpressCatalog on-line parts ordering system that Aspect Development Inc. has bundled with SAP's R/3 business software. Together, the software systems should give Bombardier links to its customers that will help it build a database for spotting maintenance trends. Another possible linkage is with a trouble-shooting software from Techmate now under evaluation. Techmate provides feedback on which component, out of many suspects, is most likely to be causing a fault.

**With its maintenance manuals** already on CD-ROM, Bombardier has recently completed a pilot program with Challenger 604 operators to put the manuals on the Internet as well. "Less than 30% of operators today are using the Net as a normal means of communications, but I think that's going to change dramatically in the next six months to a year," Orcutt said.

Maintenance Engineering Director Jean-Louis Peree's highest priority at Bombardier Aerospace Regional Aircraft is to reduce incidents of no fault found. The worldwide no-fault-found removal rate was 400,000 components in 1997 at an average cost of \$800 per removal, he said.

The task requires a good database. To get it, Bombardier Regional launched an Electronic Data Standard Exchange (EDSE) two years ago to collect component performance data directly from operators. "The quality and performance obtained so far has been fantastic," Peree said.

The data have revealed that no-fault-found component repairs are often the result of lack of operator training, such as airline personnel using procedures that cause components to fail prematurely. The company has formed a working group with suppliers--Honeywell, Rockwell Collins, Dowty, Messier-Dowty, AlliedSignal--for roundtable discussions with airlines.

EDSE is expected to become part of JARS 25 next January thanks to the promotion of the European Regions Airline Assn. Transport Canada has it under consideration, and Peree has begun talks with the FAA.

**Rockwell Collins** has used e-business systems with its suppliers for 3-4 years and feels it has a comprehensive materials process in place, Vice President Harry Gregory said. It is currently working on an electronic catalog system for introduction next February.



The new system was purchased off-the-shelf from Broadcast and modified slightly. It uses a shopping-basket motif, allowing customers to order from the Web at any time, searching either by noun or part number. They can see what parts are available and in what quantities. Once they've made their selections, or back-ordered, they "check out" by specifying what delivery options they want and arranging to pay the bill with an electronic transfer of funds.

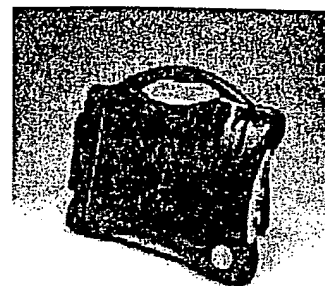
Rockwell Collins checks component reliability with a tracing system called Recap. The system's reliability has been excellent, Gregory reports, but a drawback is that customers must send in the data using floppy disks. By the fall of 2000, he expects to use the Web to transfer the data.

A further system advance will happen next year when the company introduces an on-line training capability. Such interactive technical data will be especially useful for service bulletins and can include text, graphics and multimedia presentations.

Gregory sees a greater need for component suppliers to cooperate with airframe makers to improve customer service. "The technology is here today to transform the aviation market," he said. "The constraints are our ability to see the business applications and use the technology that's currently available."

Engine makers have been among the most aggressive converts to IT services for MRO. Pratt & Whitney offers an on-line service for spare parts that allows customers to check the status of their order. It also uses the Internet to place orders from its suppliers. When received, the incoming shipments are bar-coded for content. Once the package is scanned, suppliers are automatically paid.

General Electric is expanding onto the Web as well, IT Manager Virginia Waller said. It uses Oracle software for its manufacturing and maintenance business systems but is turning to Enigma Inc.'s electronic publishing software to provide electronic manuals and documentation for customers. Eventually, the company wants to use the Internet to provide services such as video links, showing how to change out parts in a 3D mockup, she said.



**Building rugged portable maintenance aids for MRO operations is highly competitive. This Shopman touchscreen system from Cimline is in beta testing.**

When it entered the A&D arena, Enigma focused on engine makers and won commercial contracts at Pratt & Whitney, International Aero Engines and General Electric, plus Rolls-Royce for the RB-199 engine on the Tornado fighter. Enigma CEO Jonathan Yaron said the company's goal is to use the Net to bring system manuals, drawings, service bulletins and other documents readily to hand so mechanics do not have to conduct time-consuming paper searches.

"Mechanics spend 15-20% of their time looking for documentation," Enigma CEO Yaron said. "We can reduce that time to about 8% with electronic manuals and improve MRO productivity between 7-10%."

**Cimlink is following** a similar path with its Shop Excellerator worksript product. CEO John West noted that the MRO industry faces a shortage of skilled personnel, so technicians are being called upon to do tasks they haven't seen before. Besides mixing electronic manuals, service bulletins and task cards, Cimlink's Shop Excellerator is designed to guide technicians through procedures with which they are not familiar, while alerting them to company rules. An electronic checkoff list assures that procedures are followed. Delta Air Lines is the newest customer for Shop Excellerator, recently signing what is described as a multimillion-dollar contract.

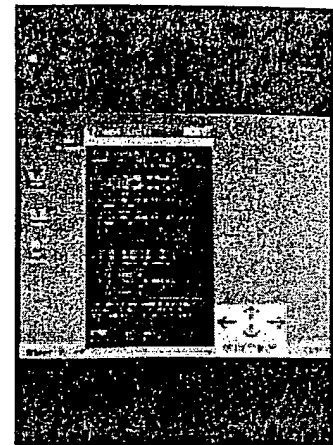
A number of companies are developing computers to withstand the rigors of shop floor use. Tecstar Demo Systems Div. has developed a portable maintenance access terminal for the 777, while Cimlink is introducing a touch-screen system called Shopman that has no keyboard and no mouse. It is actually an input/output part using a fibre optic cable connection at various junctures on the shop floor, much as pneumatic connectors are made for power tools. The cable connects Shopman to a CPU using Cimlink's e-shopfloor software. With a swipe of a company ID, a technician may get work assignments plus any technical updates needed.

As a component supplier, AlliedSignal Aerospace Services' goal is to develop a database on the supply needs of its customers so it can help them predict their order rates. To do this, AlliedSignal uses a forecasting tool from LPA Software that does demand analysis and stockpiles--rotables, upgrades, teardowns, etc.--using transaction data from AlliedSignal's SAP R/3 system.

Using United Airlines as a lead customer, AlliedSignal is developing a system to connect an airline's planning and forecasting team electronically to AlliedSignal's internal repair and work-order system to eliminate telephone calls and faxes. The company is about to go live on the Web at eight global repair sites. Similarly, it is linking its suppliers with electronic orders.

The United effort also involves electronic linkages to predict what will need to be repaired in a component overhaul and automatically alert suppliers of their corresponding order fill dates. Taiclet wants to see the concept in action in another year.

He was speaking for many in the industry when he said, "We've got the theory and concept down. Now it's up to the execution."



PAUL BOWEN

**Bombardier wants to improve on its Centralized Aircraft Information Maintenance System by giving crews inflight access to maintenance manuals via satcom.**

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**Aviation Week**

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05028



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January 14, 2000 Page 1

By Sean Broderick

## Delta Mechanics Embrace New Shop Floor Technology

Barely two months into rollout of Delta's new electronic shop floor system, the airline and vendor Cimlinc believe the product has cleared its first, and possibly most significant, obstacle: acceptance by the mechanics.

"It's positive," Delta's Guy LaRosa told *AS&M* earlier this week when asked about his mechanics' initial feedback after just a few hands-on weeks with the new system. "Last week, we had a lot of our senior management visiting the shop floor, and they saw the difference. So I'd say it's been successful."

Less than three months into its first real-world test, Cimlinc is hardly satisfied. But CEO John West conceded that getting positive early feedback from his launch customer's hands-on people is a huge milestone.

"The biggest hurdle was acceptance by the mechanics," West told *AS&M*. "There's been multiple attempts at multiple places to try and equip mechanics with computer systems with no success. From day one with Delta, it was driven into our heads that this had to be acceptable to the mechanics or it wouldn't work."

Integration of Cimlinc's Shop Excellerator is far from complete at Delta. Some eight months after the deal was struck (*AS&M*, Apr. 16, 1999), phase-in began in mid-November in the carrier's landing gear shop, with the rest of the so-called back shops slated to be online by Oct. 1. Next up: component tracking, which should start to go live sometime next month. Assuming an anticipated follow-on deal is struck, Cimlinc would equip Delta's line and hangar maintenance crews with the electronic process management and tracking capability.

"We have kind of a placeholder in their budget in both hangar and line," West said. "We both have some work to do to scope that out. But it looks like they're amenable to going forward with that."

Early returns from Delta's shop floor aren't hurting Cimlinc's cause. Although LaRosa, tasked with managing the rollout from the carrier's side, acknowledged that some "production bugs" have been found, mechanics are praising the new technology's potential even as management hopes merely to get them accustomed to it in the early phases of the rollout.

"What we're trying to do in this first release is get everyone used to the new technology...the look and the feel," said LaRosa. "Then, we've got other components we intent to implement. Right now, we're just going for a good solid baseline."

### More Efficient Already

Even so, Delta's affected shop floors are already more efficient.

"In the case of landing gear, mechanics spend less time walking around and collecting data because we've incorporated several paperwork documents that are available through the same interface," LaRosa explained. "Also, just the time it takes to interface now is so much shorter. Before, it might have taken guys until lunchtime or later to produce six parts. Now, guys are telling me they can get 11 or 12 done before nine o'clock in the morning."

"Also, they're not having to handle the paper in the manner they were before. We've gotten a lot of positive feedback on that. They just identify what tasks have been completed for the sake of physically routing the parts from one place to the next. Everything else is done in the system. You don't have all this printing and signing off going on."

Perhaps most importantly, Delta is gathering data that will allow analysis of all types on an unprecedented scale — all with less input effort needed. Before, tasks were completed, but making an electronic record meant another step by mechanics, entering data solely for the purposes of having it later.

"The real benefits of these systems are in the information they're capturing," West said.

Delta's efficiency watchdogs "are using new databases for productivity and shop analysis," LaRosa noted. "The same data will be collected without having the mechanic do his execution, then go to an access database and make a bunch of inputs so they can have their shop reports."

Even with the positive opening few weeks, Delta's rollout continues at a conservative clip.

"There are a lot of areas in the software we haven't gone into yet," LaRosa said. "We're just trying to make a smooth transition before we go back and dive into it even more."

The cautious pace notwithstanding, Delta sounds like a carrier that won't be turning back its shop floor clocks anytime soon.

"We ask the mechanics if they want to back to the old system, and they say no way," LaRosa said. "They can see the possibilities."

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May 2000 v37 i5 p108

◀ Document 3 of 61 ▶

### Paperless aircraft inspection.

(Product Information)

**Author**

Kelly, Sean

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Puma Technology helped an **aircraft**-manufacturing plant do away with an outmoded pen-and-paper system for collecting surveillance information on military planes with Satellite Forms software on handheld computers. Inspectors at Boeing's St. Louis plant had previously used a paper-based system, to track how well military jet production followed planning, engineering drawings, and specifications, and to determine whether there were anomalies in the process. This time-consuming process made it difficult to ensure that the most recent information was recorded.

Satellite Forms software runs on the Palm Computing platform device carried by inspectors, allowing them to collect and enter data into a backend system in real time. The handheld device displays an electronic version of a formerly preprinted document. "This new data collection has unprecedented advantages over our previous pen-and-paper approach and has made the lives of Boeing inspectors and managers much easier," says Mike Heffernan, manager of assembly **inspection** at Boeing in St. Louis. "We are now able to capture data quickly with improved accuracy since Satellite Forms is enabling us to download our surveillances directly to the database, thus eliminating the need for additional data input."

Satellite Forms integrates handheld devices with data from Oracle, DB2, Lotus Notes, Microsoft Access, and other databases. Applications developed via Satellite Forms are fully extendable, making them capable of meeting new application requirements and achieving tight integration with desktop and server database applications.

[www.pumatech.com](http://www.pumatech.com)

Circle 252 for more information from Puma Technology, Inc.

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05028

# AEROSPACE ENGINEERING

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November 1999 Page 21

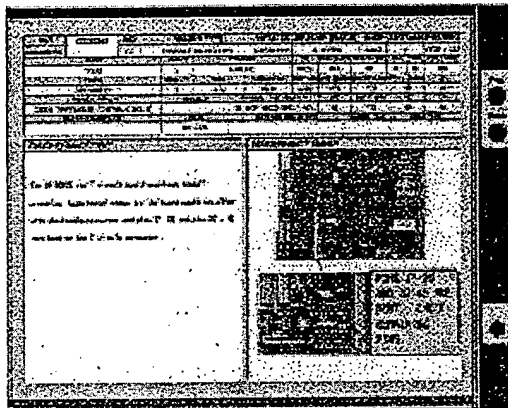
## Software enhances shop floor planning

CIMLINC Inc.'s Shop Excellerator is a software designed to support planning, executing, and tracking of work processes in the shop. It was developed for shop environments with complex, highly variable, and labor-intensive work processes.

The software electronically integrates the planning process with work execution in the shop. With a simple point-and-click interface, Shop Excellerator provides users immediate access to current, accurate information. This serves as a communication bridge between planners, managers, supervisors, assemblers, technicians, and inspectors, which is necessary for solving the complex problems that may arise during aircraft assembly, maintenance, or operations.

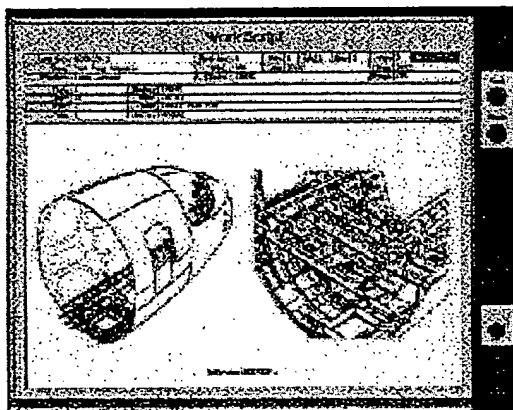
The software's features provide:

- a single point-of-mechanic's information flow



*With Shop Excellerator's point-and-click interface, aircraft technicians can gain immediate access to current and accurate part or repair information.*

- activity-based costing
- scrap and rework minimization
- component part tracking
- and compliance reporting.



*CIMLINC's Shop Excellerator is designed to support planning, executing, and tracking of work processes in the shop.*

Delta Air Lines has recently signed a license agreement with CIMLINC for its Shop Excellerator. "We selected CIMLINC's Shop Excellerator product because we believe that it will simplify the administrative overhead required to record compliance and collect activity-based cost information," said Ray Valeika, Senior Vice President, Delta Air Lines Technical Operations. "It will also bring a great deal of data into a single, user-friendly environment."

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05028

# Overhaul & Maintenance

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January/February 2000 CIMLINC Article: Page 51

Written by: Jim Proulx

## IT Packages All Set for MRO Push

**MRO companies are due for a big push in IT upgrades.  
Software companies are scrambling for a piece of the action.**

**CIMLINC Shop Excellerator:** CIMLINC aims to provide a "mechanic-centric, compliance-focused" software package that delivers point-of-work, easy-to-use service to mechanics while tracking performance data for the enterprise. The package includes three modules: Author, which allows creation of multimedia job cards with embedded process and procedural controls to ensure FAA compliance; Work, which presents multimedia work instructions, configuration compliance, process validation and real-time data collection services directly to mechanics; and Resolve, which provides documentation, disposition and follow-up functions for non-routine and non-conforming work. The product is packaged with parts-tracking and data-mining components that help track aircraft configuration, parts limits and structure, and provide reports on operational conditions such as manpower use and cost and schedule variance, and allow for "what-if" forecasting scenarios. The system is built to work with the company's ShopMan portable terminals that work on touchscreens for ease of use on the shop floor.

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# The Total Solution

**e-shopfloor** - the TOTAL solution - harnesses the power of the Internet to deliver communication, information, and collaboration right to the point-of-work anywhere on the shop floor. *e-shopfloor* enables mechanics, engineers, management, third party vendors and others to instantly resolve all the non-routine activities that can tie up and shut down valuable manufacturing or maintenance operations.

With the combination of multimedia work scripts and point-of-work computers, validation and performance data is gathered, providing management with quantification and knowledge of shop floor activities needed to make sound business decisions and continuous process improvements.

CIMLINC's *e-shopfloor* delivers the following components to meet the needs of Aircraft Manufacturing and Maintenance Execution:

## Shop Excellerator™

- ◆ Touch & Go interface
- ◆ Multimedia work scripts enforcing all best practices, processes, and procedures
- ◆ Provides management with direct access to all validation and performance data
- ◆ Helps to resolve non-conformance problems immediately

## EMPOWER

- ◆ Consultative studies
- ◆ Full implementation
- ◆ Integration
- ◆ Training, and more

## SHOPMAN™

- ◆ Withstands the harsh shop floor environment
- ◆ Gives shop floor personnel the power of the Internet
- ◆ Gives access to the rest of your organization

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# e-Shopfloor

**e-shopfloor** enables the technology behind rapid deployment of lean manufacturing, six sigma and ISO 9000 programs. By providing up-to-the-minute data from the shop floor, *e-shopfloor* maximizes the investments in ERP, Advanced Planning and Scheduling, and Supply Chain Management Systems. Revolutionizing the Aircraft Manufacturing and Maintenance industries, *e-shopfloor* links mechanics everywhere to the networked organization.

As the COMPLETE Shop Floor Solution, *e-shopfloor* harnesses the power of the Internet to:

- ◆ Collect work execution data in real time, making validation and performance assessment data a natural by-product of shop floor activities.
- ◆ Enable rapid, sound business decision-making through direct access to shop floor data, quantification and knowledge.
- ◆ Support true activities-based costing for manufacturing and MRO activities.
- ◆ Collect real-time data for assessment, analysis and continuous process improvements.
- ◆ Deliver communication, cooperation and collaboration right to the point-of-work anywhere on the shop floor.
- ◆ Enable mechanics, engineers, management, suppliers and others to instantly react and resolve the non-routine activities that can tie up and shut down valuable manufacturing or maintenance operations.
- ◆ Guide and direct the mechanic with interactive work scripts at the point-of-work.

# SE Author

CIMLINC's **SE Author** is the plan authoring and plan management application of Shop Excellerator. SE Author supports all departments responsible for defining work content. It also supports the personnel responsible for assigning and monitoring work activities.

## Responsibilities

SE Author was developed to support authoring plans and managing authoring processes. These two areas include the following activities:

- ◆ Defining the common look and feel of the work script templates, as they will be delivered to the shop.
- ◆ Developing standards for consistency in the content and format of work instructions.
- ◆ Creating and maintaining standard work components (methods, text, instructions, etc.).
- ◆ Creating and maintaining the individual plans.
- ◆ Managing the integration of plan changes with work-in-process.
- ◆ Participating in the collaboration, review, and approval of new or revised plans.

## Benefits

SE Author improves the management of plan authoring by providing real-time functionality for:

- ◆ Initiating the creation of new plans.
- ◆ Tracking the planning backlog and prioritizing authoring tasks.
- ◆ Obtaining real-time statuses of shop plans in process.
- ◆ Controlling plan development and review.
- ◆ Ensuring that authorization is complete before plans are released to the shop.

The application of systems dynamics to the re-engineering of value processes

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**ABSTRACT:** Value processes are those high-level processes which are critical to achieving an organization's objectives. The reengineering of a value process which was not working efficiently and causing serious problems to an important new business operation is described. Conventional process engineering tools were initially used and, after these failed to deliver significant improvement, the problem was redressed using system dynamics and the i-THINK modeling tool.

**TEXT:** Introduction

Manufacturers and vendors of computers and software have, over the last few years, been forced to change fundamentally the way they do business. At the smaller end of the market, personal computers (PCs) and hardware running Unix-based applications have become ubiquitous. Consequently, hardware profit margins have been seriously eroded as manufacturers have been forced to compete on price for sales of hardware and basic software. While applications software and related services provide opportunities to improve profit margins, it has still been necessary for many vendors to address the issue of margins in other ways. One solution was to create a low-cost selling operation dedicated to the sale of PCs and Unix computers to large customers wishing to buy these products in volume. To facilitate such a low-cost operation, production and distribution to customers of a catalogue of the products was essential. Customers could then order directly against items in the catalogue thereby, in theory, significantly reducing the operational costs.

Such an operation was developed for ICL's Government and Major Corporations Division in response to demand from major accounts. Although it was successful in winning catalogue sales contracts, however, the organization failed to meet its profit targets. Examination of the problem identified that the "costs of the operation" were much higher than expected. It was decided therefore to re-engineer the business processes with the aim of reducing the cost of selling to a level at which the organization would meet its targets. Initial attempts to do this using conventional process re-engineering methodologies met with limited success. A more radical approach was required and a deeper understanding of the problems needed. To achieve this it was necessary to do two things:

- (1) Identify the value processes, i.e. those high level sets of processes which were absolutely critical to achieving the operation's objectives.
- (2) Understand how the value processes interlinked and fed back inter-dependencies. This appeared to be particularly important where the

value processes interfaced with the customer.

Recognition that there was feedback and interdependence in the system indicated that an approach based on systems dynamics could be appropriate. Consequently it was decided to adopt the modelling approach based on i-THINK software and attempts were made to model the system. It was agreed that if a model of the system could be developed using i-THINK, then simulation of the model would enable the team to identify the high cost areas in the processes of the system. This achieved, it would then be feasible to re-engineer these processes and simulate them using i-THINK prior to their implementation.

The application

One of the sales teams which had won a catalogue sales contract at the beginning of 1993 sought help to address their issues in the order processing process. The team was experiencing the symptoms of a set of problems but was unable to describe exactly where the problems lay.

At the time, soft systems analysis was decided as the appropriate technique to use in identifying the problem areas. The analysis work was carried out in three phases.

#### Phase 1

The management team was asked to meet and give their views of the perceived problems. This enabled the management team to define precisely the scope of their interests and their understanding of the order processing process. Their descriptions of the process were documented using basic data flow diagramming techniques (DFD), as adopted in Structured System Analysis and Design Method v. 4. This laid the foundation for further in-depth analysis[1].

#### Phase 2

A random sample of team members was interviewed on an individual basis. The sample was chosen in such a way that each job role was represented by at least two team members currently working in that role at the time. The purpose of the exercise was to gain an in-depth understanding of the activities within a sub-process and how one sub-process interacted with its neighbouring sub-processes. The results of each interview were documented in the format of role activity diagrams.

#### Phase 3

Having established a good understanding of the sub-processes under the scope of the order processing process, a workshop was conducted where the team was asked to conceptualize on the process under the facilitation of an analyst. The process and its sub-processes were described by the activities and the inputs, outputs, controls and mechanisms (ICOM) of those activities. The process and its decompositions were documented using the ICOM definition method, a technique which is very similar to the structured analysis and design techniques[2].

#### Results and observations

The process analysis was completed with limited success, giving the team a good understanding of their processes. The problem areas were described and

located in relation to the sub-processes. As an outcome of using various conventional process analysis tools and techniques, the team had compiled a list of problems and requirements. The team had also achieved a common understanding of the order processing process.

A number of observations were made:

- \* Although the problems were described more fully than before, the size of the problem was not quantified. The team was unable to establish a baseline for the process in question from the existing information and operational data which it had received.
- \* The techniques which were used during the analysis did not enable the team to define the area of interests in very rigid terms. As a result, it had become very difficult for the team to decide what measurables they required in order to enable it to gauge the efficiency and effectiveness of its process.
- \* The team had a very strong and established culture. Although the team was facilitated to conceptualize on what the system required and to identify areas of change while making the comparison of the ideal world and the real world, it had been very difficult to mobilize its members to break out from their current frames of minds to perform lateral thinking and creative problem solving-. Conducting the analysis in the conventional way by describing the flow of the sub-processes encouraged the team to think along the daily work flow. As information systems had been a key mechanism to the work flow, the team was deeply embedded in the thinking that the sub-processes were driven by information technology rather than vice versa.

The authors were keen on the concept that change ought to come from the team and should not be prescribed by any outsiders but felt it was extremely difficult to make any further progress. Consequently, while progress had been made by the use of conventional process modelling techniques, it had been realized that these techniques had not produced a solution to the problem and that another approach should be sought.

#### Systems dynamics and i-HINK modelling techniques

The systems dynamics approach[3,4], which was first introduced to the authors through the i-THINK modelling tool, was believed to be an alternative approach to the conventional methods.

It had been decided that the approach should be tested for its suitability under a laboratory environment before it could be introduced to the team. With the assistance of Brunel University, it was agreed that the authors would re-describe the process and its related problems using the i-THINK modelling tool at the university.

The exercise was divided into two stages:

- (1) By applying the concepts of systems thinking, the authors attempted to identify and define an overall model of the catalogue sales process and in particular focus on the feedback loops within the boundary of the model.
- (2) Having identified the feedback loops, the process activities of each loop were described and simulated using the i-THINK modelling tool in an

attempt to identify the activities which were acting as inhibitors to the cost effectiveness of the process.

#### The results

The initial investigation had focused on a single process, called order processing, concerned with the receipt, validation and fulfilment of an order. The system dynamics approach, however, forced the team to look beyond this single process by examining its boundaries. A second value process was thus identified. This was concerned with sales activities prior to receipt of the order. It was discovered that, while the customer could order directly from the catalogue, they still preferred to work through an enquiry and proposal system before placing the order. In this they were encouraged to a degree by the sales teams, who recognized that, by being involved at the pre-order stage, they could eliminate work in validating orders once received.

Therefore a second value process was discovered. Further investigation of this value process called proposal response identified that it had two interlinked chains. The first chain was the arrival and response to proposals and the second chain was the sales activity which alternated between selling and writing. It was the identification of two discrete chains within the proposal response value process which provided a key to the overall problem. The initial investigation using systems dynamics identified a much more complex picture than linear process modelling techniques had revealed. The system had a second value process, proposal response, which itself contained two chains. This model can be seen in Figure 1. (Figure 1 omitted)

Having identified the main chains and documented them in i-THINK, attention turned to analysing the linkages and in particular the feedback loops. This was where the approach fundamentally differed from the conventional process modelling method used at the beginning of the project. Discussions with the sales teams and the support staff identified the dependencies in the processes which were between:

- \* sales staff selling and writing proposals;
- \* a proposal being submitted and an order being received;
- \* an order being completed and a proposal being turned into an order;
- \* an order being completed and a proposal being received;
- \* staff selling and a proposal being received.

These linkages are shown in Figure 2. (Figure 2 omitted)

The linkages as identified provided the necessary reinforcing and balancing loops in the model. The investigation helped to determine the following principles which underlay the catalogue sales process:

- \* Staff could be either selling or writing proposals. With finite staff available, effort spent in writing proposals limited future sales (linkages 1 and 5).

\* Even though the customer had a contract with ICL which allowed him to use the catalogue system, having requested a proposal there was no requirement that this be turned into an order (linkage 2).

\* The performance of ICL in completing an acquired order, by delivering on time and with the correct products, had an impact after a delay on the rate at which proposals arrived and the conversion of proposals into orders (linkages 3 and 4).

#### Completing the model

The detailed modelling based on investigation of the main chains and linkages produced the final version of the catalogue system model. This is shown in Figure 3. (Figure 3 omitted)

The elements of the model which represented the key issues in the process were discovered to be:

- \* fulfilment performance; and
- \* proposal write time.

Fulfilment performance was an indicator of how well orders were completed. A relationship was modelled where, as the rate of order-validation and orders-fulfilled (fulfilment) increased, the fulfilment-performance decreased. This represented the situation which occurred in reality which was that errors crept into the system as the load on order processing increased. The impact of a decline in fulfilment-performance was to create an adverse customer opinion (customer-opinion-delay). This was modelled with a delay factor of ten weeks. In turn customer-opinion-delay impacted on the selling effectiveness thereby making it necessary to put more selling effort into winning proposals. Customer-opinion-delay also impacted on the success rate, which was the factor determining the proportion of proposals which became orders. Introducing these feedback loops created a dynamic model which interworked the three processes.

Of more critical importance was the proposal-write-time. This was an essential element in the model for two reasons:

- (1) It provided input into the deployment-rate flow which decided whether staff were selling or writing.
- (2) It provided a necessary link between the two main chains which represented the proposal value process.

The model had been created to represent selling and writing as an either/or activity for a sales team of finite size, the purpose of the team being to win proposals and turn them into orders through a response process. The number of proposals received related directly to the number of staff selling and their selling effectiveness. As proposals had to be responded to by a deadline, writing had to have priority over selling and the effort to produce a proposal was a very significant factor.

Creation of these feedbacks and relationships created a model which seemed to be totally logical and consistent at a qualitative level. Quantitative data were then applied which were extracted from the performance of the sales and order processing team to provide input for simulation of the model.

### Pre-simulation results

While the model was being constructed it was sensible to carry out some simulations to check out ideas and validate relationships in the model. Additionally, as the i-THINK software and systems dynamics principles were new to the authors, time was spent in investigating the theory and practice, which involved running the model at every opportunity. However, before simulation commenced in earnest, examination of the model in its qualitative form through inspection enabled a major weakness in the process to be identified. The weakness was in the staff value chain. Examination of the model raised two questions:

- (1) Why were staff spending time writing proposals?
- (2) What were they writing in these proposals that required so much effort?

Catalogue sales was targeted to be a low-cost selling operation where a customer could order products described in a catalogue. In principle, therefore, the selling activity should be sufficient to produce orders. In reality ICL staff were providing customers with free technical advice and guidance to configure and size their required computer systems. That was a legacy from the past when support activity of this type was given for the configuration and sizing of bespoke mainframe systems. This situation was clearly against the principles of catalogue business operation. It was further compounded by the fact that the staff who were doing it were highly paid IT professionals.

Consideration of the situation revealed by the system dynamics approach drew the following conclusions:

- (1) Systems configuration in the catalogue selling operation was not a task which should be done by the vendor.
- (2) Its happening was a clear case of invasion of the value process[5] by the client.
- (3) Removing the activity from the value process would achieve two results:
  - \* reduce the cost of the operation by removing a manpower-expensive activity;
  - \* free up staff to focus on selling and thereby increase the orders received.

### Simulation results

The model was run over a 104-week cycle. This was chosen because the sales campaigns and order cycles took about ten to 15 weeks and it was necessary to study the behaviour over a number of cycles. The key indicator describing the model's behaviour was selected to be the stock acquired-orders, primarily because it reflected the overall objective of the system.

The model after simulation was found to display classic systems dynamics behaviour of overshoot and compensate[6], the actual curve corresponding to a second order damping. With the two delays built into the system, such



behaviour was to be expected. The result is shown in Figure 4. (Figure 4 omitted)

Having derived a model which had a self-balancing structure--equilibrium was found to be reached after 180 weeks--attention was turned to establishment of the sensitivity variables in the model.

Examination of the staff selling/staff writing issue, to prove the point about removing the staff writing activity from the process, was tackled by progressively reducing the proposal-write-time converter from its initial value of two weeks down to 0.5 days. This had the desired effect in that the model then displayed the result of staff deployed on selling always above 90 per cent of total resource. It also increased the acquired order by some 60 per cent as is shown in Figure 4.

The second area to receive investigation was the feedback loops, particularly those concerned with fulfilment performance impact back into selling effectiveness and the success rate of turning proposals into orders. Initial results indicate that this area is highly sensitive in that changes in the profile of the fulfilment performance graph have an impact of over 100 per cent on the number of orders acquired and of over 70 per cent on the staff selling/writing ratio. There is further research to be done in this area to establish the exact detail of the relationships. That the model is sensitive to feedback is nevertheless a significant result on its own since it provides a second area where the system can be re-engineered to improve its effectiveness.

#### Lessons learned

The problem was examined via two very different approaches which gave complementary benefits to the understanding of the problem. The experience had shown that while the systems dynamics approach has its strengths over more conventional methods, it also has some limitations.

#### Strengths of the systems dynamics approach

The strengths were as follows:

- \* By applying the systems thinking discipline using the systems dynamics approach and with the aid of the i-THINK modelling tool, not only are the processes being examined but the company's policies around the processes are also subjected to scrutiny. This is a key strength over the soft systems approach.
- \* The systems dynamics approach provokes serious systems thinking. Taking the approach in modelling will help one to focus on the business boundary where the problem lies rather than the process boundary where the problem manifests itself most. This brings out the key differentiator of business process re-engineering against the traditional organization and methods or total quality management[7].
- \* One of the key success criterion in business process re-engineering is the capability to establish business metrics and measurables for better business control. Using the systems dynamics approach in conjunction with the i-THINK modelling tool, one is led to think more deeply about how to control and monitor processes in quantifiable terms. This has been found to be very difficult to achieve using the soft systems analysis approach due to its resemblance with the common mind-set in workflow analysis.

## Limitations of the systems dynamics approach

The limitations are as follows:

- \* The systems dynamics approach is encompassed by a strong engineering discipline. In soft areas where the users have difficulties in expressing the problems in the first place, this approach may not be as effective as soft systems analysis[8].
- \* The systems dynamics approach can work best at the strategic level of the overall business. It can become over-complex and difficult to apply when it operates at a detailed level of processes flow and work activities analysis. However, it is suspected that systems dynamics may also have applicability at the micro process level where the process is highly complex.
- \* Systems dynamics in conjunction with i-THINK enabled the problems and limitations of the process to be defined and solutions derived. However, it will need to be complemented by a process re-design tool in order to construct and enact the new processes.

## Conclusions

Two very different approaches were taken to resolve the process problems of the catalogue sales operation. The first approach, using conventional system analysis and process modelling techniques, enabled the team to develop an understanding of the activities inside the process. However, it did not enable the underlying problem to be identified and resolved. Systems dynamics, however, forced the authors to think about the process and examine the process boundaries. As a result, the other processes were identified and as a result the underlying problems were identified. It is significant also that the thinking and analysis steps were sufficient to identify the problem without the need to build and simulate a rigorous model in i-THINK.

The authors conclude that systems dynamics coupled with a modelling tool such as i-THINK provides a powerful method to understand and re-engineer business processes at the macro level. However, to proceed and enact these processes through re-design and definition still requires use of process modelling tools which will integrate with systems building tools.

There are no doubts in the authors' beliefs that the systems dynamics approach can be applied as a very powerful consultancy tool at a strategic level of the business paradigm.

As a result of the work of the authors, systems dynamics is being introduced to ICL's consultancy group and as an additional skill and toolset.

As regards to the catalogue sales operation, the authors' findings to date have been accepted by management and planning is under way to implement them. The authors have also identified that areas within the model require additional investigations. These are in the order fulfilment and fulfilment performance processes. These sub-processes cross organization boundaries within ICL and are not operating at required levels of effectiveness. It is the authors' intention to extend their existing i-THINK models in these

areas in an attempt to understand the dynamics of these sub-processes especially as they cross the organizational boundaries.

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